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THE
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BEING THE ORGAN OF THE
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OF GREAT BRITAIN AND IRELAND.

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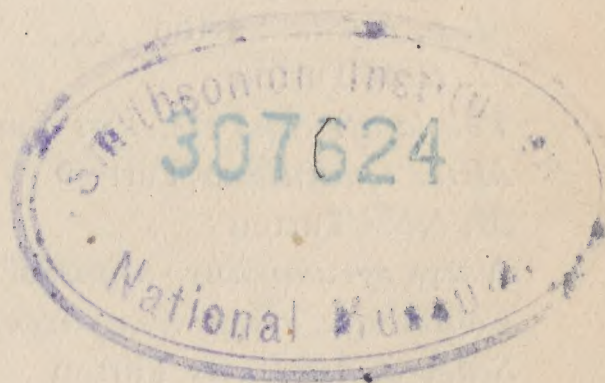
BY

J. R. LE B. TOMLIN, M.A., F.E.S.

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Mitra tomliniana Turton
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1928. Oldroyd, Mrs. Ida Shepard, Dept. of Geology, Stanford University, California, U.S.A.
1923. Oliver, W. R. B., 26, Brandon Street, Seatoun, Wellington, N. Zealand.
1896. *L* Overton, Harry, The Newlands, Boswell Road, Sutton Coldfield.
1919. *L* Paton, Mrs. Brenda Jennie, Brynderi, Llantilio, Crossenny, Nr. Abergavenny
1927. Paton, Cyril Ingram, Ormley, 7, Cavendish Road, Sutton, Surrey.
1886. Pearce, Rev. S. Spencer, Steepleton House, Iver, Bucks.
1921. Peile, Lt.-Col. A.J., R.A., 18, Leopold Road, Wimbledon, S.W. 19.
1913. *L* Pellow, N. E., The Homestead, Arrow, Alcester, Warwickshire.
1918. Perry, Edmund E., 6, Stuart Crescent, Wood Green, London, N. 22.
1928. Petersen, Svend Kierulf, Oluf Bagtersgade 26, Odense, Denmark.
1908. Phillips, R. A., 7, Magdala Terrace, Gardiner's Hill, Cork.
1923. *L* Prashad, Dr. B., Zoological Survey of India, Indian Museum, Calcutta.
1897. Preston, Hugh B., F.Z.S., c/o Westminster Bank, 25, Sussex Place, London, S.W. 7.
1921. Price-Jones, Cecil, M.B., The Apple Orchard, Loom Lane, Radlett, Herts.
1907. Priske, R. A. R., 136, Coldershaw Road, West Ealing, Middlesex.
1906. *L* Pritchard, G. B., D.Sc., F.G.S., Lecturer in Geology, School of Mines Dpt., Working-Men's College, Melbourne, Victoria.
1927. Proger, T. W., F.Z.S., Llanmaes, St. Fagans, Glamorgan.
1916. Pye, Alfred W., The Hollies, Dudley Street, Grimsby.
1916. Quick, Capt. Hamilton E., B.Sc., M.B., F.R.C.S., "Varfell," 130, Eaton Crescent, Swansea.
1930. Rehder, Harold A, 62, Orchard Street, Jamaica Plain, Mass., U.S.A.
1929. Rendall, Robert, Dawnvale, Willow Road, Kirkwall, Orkney.
1913. Rhodes, F., 113, Heaton Road, Manningham, Bradford, Yorks.
1900. Richards, C. P., Mission House, Stenalees, St. Austell, Cornwall.
1898. Roberts, A. William Rymer, The End House, 38, Fulbrook Rd., Cambridge.
1921. Robertson, Miss Jessie D., 41, Medway Court, Hampstead Garden Suburb, London, N.W. 11.
1918. Robins, E. A., Gorran, Cassiobury Park Avenue, Watford.
1922. Robson, Guy C., M.A., F.Z.S., British Museum (Nat. Hist.), Cromwell Road, London, S.W. 7.
1893. Roseburgh, John, 20, Market Street, Galashiels, Selkirkshire.
1906. *L* Salisbury, Albert E., A.M.I.E.E., 12a, The Park, Ealing, London, W. 5.
1877. *P L* Scharff, Robert F., Ph.D., M.R.I.A., 15, Sandycove Avenue West, Dun Laoghaire, Co. Dublin.
1895. *L* Schill, C. H., Crosten Towers, Alderley Edge.
1918. *L* Schlesch, Hans, L.A.S., (Copen.), Gustav Adolfsgade 14, Copenhagen, Denmark.
1924. Selous, Mrs. Kathleen Marion, 25, Church Road, Tunbridge Wells.
1910. *L* Shaw, H. O. N., B.Sc., F.Z.S., 112 & 114, Wardour Street, London, W. 1.
1904. Shaw, Rev. W. A., Peper Harow Rectory, Godalming.
1910. Shrubsole, George, 3, Hardwick Road, Eastbourne.
1895. *L* Sich, Alfred, F.E.S., Grayingham, Farncombe Road, Worthing, Sussex.
1905. Simpson, James, 242, Union Street, Aberdeen.
1899. *L* Smith, Mrs. Lucy A., Robert's House, Siddington, Glos.
1907. Smith, Maxwell, 33, Greenacres Avenue, Scarsdale, New York, U.S.A.
1900. Solly, E. H., Lea Orchard, Ottinge, Elham, near Canterbury.
1917. Sowden, Harry, Hon. Recorder, York and District Field Naturalists, 22, Victoria Street, Nunnery Lane, York.
1907. Spence, G. C., Ellerslie, 48, Poplar Grove, Sale, Cheshire.

1914. Stainton, Ernest, 70, Jubilee Road, Doncaster.
1915. Steenberg, Prof. Carl M., D.Sc., Silene Allé 9, Copenhagen-Söborg, Denmark.
1903. *L* Stelfox, A. W., M.R.I.A., Mayfield, 14, Clareville Road, Rathgar, Dublin.
1918. Stephens, G. A., F.L.A., City Librarian, The Public Library, Norwich.
1908. *L* Stobart, H. J. S., Belbroughton, Stourbridge.
1897. Stracey, Bernard, M.B., Châlet Dunbeg, Diemtigen, Simmenthal, Canton Bern, Switzerland.
1920. Sundler, Berthold, Borås, Sweden.
1895. *P* Swanton, E. W., A.L.S., The Educational Museum, Haslemere, Surrey.
1888. *P* Sykes, Ernest Ruthven, B.A., Lewell Lodge, Dorchester.
1925. *L* Tansley, Miss Gladys M., Wanstead House, Eastern Esplanade, Margate.
1928. Taraldsen, Trygve, Voll-i-Egge, Steinkjer, Norway.
1910. Tattersall, Prof. W. M., D.Sc., Zoology Dept., University College of S. Wales, Cardiff.
1895. Taylor, Fred, 42, Landseer Street, Park Road, Oldham, Lancs.
1904. *L** Taylor, Gerald Medland.
1903. Thaanum, D., Box 2214, Honolulu, Hawaiian Islands.
1907. *L* Thornton, H. G., Kingsthorpe Hall, Northampton.
1886. *P L* Tomlin, J. R. le B., M.A., F.E.S., 23, Boscobel Road, St. Leonards-on-Sea.
1906. Turton, Lt.-Col. W. H., D.S.O., R.E., The Librarian, The Library, Deanery Road, Bristol.
1924. Van Benthem Jutting, Miss Tera, Zoological Museum, Buitenzorg, Java.
1915. Van Hyning, T., Director, Florida State Museum, Gainesville, Fla., U.S.A.
1899. Vaughan, J. Williams, J.P., The Skreen, Erwood, Breconshire.
1897. Vignal, Louis, 28, Avenue Duquesne, Paris.
1902. Vincent, W. C. W., Brooklands, Priests Lane, Shenfield, Essex.
1928. Wagner, Frederick George, 12, Trelawney Road, St. Austell, Cornwall.
1898. Wakefield, H. Rowland, 7, Montpelier Terrace, Swansea.
1891. Walker, Bryant, 1306, Dime Bank Building, Detroit, Michigan, U.S.A.
1920. Ward, Arthur Wadams, Churchill, Kingham, Oxford.
1923. Waters, Ernest Joseph Hill, B.Sc., 29, Parkdale, Wolverhampton.
1900. *P L* Watson, Hugh, M.A., Hillscross, Hills Road, Cherryhinton, Cambridge.
1908. Weaver, G. H., 31, Devonshire Road, Palmer's Green, London, N.
1900. Webb, Walter F., 202, Westminster Road, Rochester, N.Y., U.S.A.
1902. Weeks, Wm. H., 508, Willoughby Avenue, Brooklyn, N.Y., U.S.A.
1895. *P* Welch, Robert John, M.Sc., M.R.I.A., 49, Lonsdale Street, Belfast.
1928. White, Miss Kathleen M., Glastonbury, Maidenhead.
1927. Wilkins, Guy Lawrence, 6, Abbott's Park Road, Leyton, London, E. 10.
1915. Wilman, Miss M., McGregor Memorial Museum, Kimberley, South Africa.
1920. *L* Winckworth, Lt.-Col. Harold C., R.A.M.C., c/o The Royal Society, Burlington House, London, W. 1.
1913. *L* Winckworth, Ronald, M.A., F.R.G.S., The Royal Society, Burlington House, London, W. 1.
1921. Wincott, A. W., 9, St. Leonard's Road, Thames Ditton, Surrey.
1917. *L* Wintle, James Benedict, F.Z.S., 30, Marlborough Road, Gunnersbury, London, W. 4.
1898. Woods, Henry, M.A., F.R.S., F.G.S., Sedgwick Museum, Cambridge.

1886. *Z* Woodward, Bernard B., F.L.S., etc., 4, Longfield Road, Ealing, London,
W. 5.
1914. Worsfold, Herbert W., 168, The Grove, Wandsworth, London, S.W. 18.
1928. Wrigley, Arthur George, 60, Pollards Hill South, Norbury, London,
S.W. 16.

Acanthinula lamellata in North Staffs.—In the early part of November last we found this species among leaves under large holly trees at Belmont, near Consall, Churnet Valley. This species was recorded by Garner from Cotton Dell, near Oakamoor in 1844 and has been found at intervals there from about 1890 to 1929, but not elsewhere as far as we have been able to find out (living) in the County. The Belmont locality is about four miles farther north, but still in the Churnet Valley. The species here was associated with *H. alliaria*, *E. fulvus*, *Z. excavatus*, *A. aculeata* and *S. edentulum*.—J. & W. HILL (*Read before the Society*, Feb. 5th, 1930).

Helix aspersa with translucent markings.—I have only recently noticed translucent markings in the albino form of *H. aspersa*, the *exalbida* form being usually plain. One example is from the Isle of Wight, the other from Alkham, near Dover.—LIONEL E. ADAMS (*Read before the Society*, Feb. 5th, 1930.)

ACCOUNTS FOR THE YEAR ENDED DECEMBER 31st, 1929.

Income and Expenditure Account.

RECEIPTS.		£	s.	d.
To Annual Subscriptions for 1929 :				
144 at 10/-	72	0	0	
2 at 7/6	0	15	0	
23 at 5/-	5	15	0	
	<hr/>			
	78	10	0	
Arrears ...	6	15	0	
	<hr/>	85	5	0
,, Sale of Publications ...	21	14	9	
,, Advertisements ...	2	12	0	
,, Contribution to cost of ... Illustrations ...	0	17	3	
,, Transfer from Life Member- ship Fund ...	10	0	0	
	<hr/>	£120	9	0

EXPENDITURE.		£	s.	d.
By publishing and distributing <i>Journal of Conchology</i> , Vol. xviii, no. 9	32	9	10	
,, no. 10	25	17	9	
,, no. 11	22	4	1	
(est'd) ,, no. 12	30	0	0	
	<hr/>	110	11	8
,, Authors' Reprints ...	10	6	11	
,, do (estd. cost)...	5	0	0	
	<hr/>	125	18	7
Less provision made in account for 1928 ...	35	0	0	
	<hr/>	90	18	7
,, Warehousing Stock ...	1	10	0	
,, Fire Insurance ..	0	10	0	
,, Subscriptions :				
Malacol. Society I	1	0		
Zoological Rec. 2	7	0		
Lancs. & Chesh.				
Fauna Com'tee 0	5	0—	3	13
,, Officers' Expenses ...	8	14	2	
,, Balance, being excess of income over expenditure	15	3	3	
	<hr/>	£120	9	0

Life Membership Fund.

To amount of Fund, Jan. 1st, 1929	£	s.	d.	271	13	8
„ Dividends and Interest	12	16	8			
	£	284	10	4		
By Commission on purchase of stock	£	s.	d.	0	2	6
„ Transfer to Income and Expenditure Account	10	0	0			
„ Amount of Fund, Dec. 31st, 1929	274	7	10			
	£	284	10	4		

Research Fund.

To Donations :	£	s.	d.			
H. H. Bloomer	100	0	0			
Anon	100	0	0			
Dividends	4	11	2			
	£	204	11	2		
By Amount of Fund						
December 31st 1929	£	204	11	2		

BALANCE SHEET.

<i>Liabilities.</i>	£	s.	d.	<i>Assets.</i>	£	s.	d.
Annual Subscriptions paid in advance	2	10	0	4% Funding Loan, £338	0	5	
Est. cost of <i>J. of C.</i> , vol. xviii no. 12, and Authors' Rep'ts	35	0	0	cost	275	0	0
Life Membership Fund	274	7	10	4½% Conversion Loan, ...			
Research Fund	204	11	2	£202	13	3	
Balance of Income & Expenditure A/c 15	3	3		cost	200	0	0
Less debit Balance				Cash at Bankers	44	0	1
January 1st, 1929 12	12	2					
	2	11	1				
	£	519	0	1			
					£	519	0
							1

NOTE.—Assets in addition to those set out in the Balance Sheet are (a) Library; (b) Cabinets and Collections; (c) Stock of unsold Publications; (d) Annual Subscriptions in arrear.

CHAS. OLDHAM,

Audited and found correct, 2nd January, 1930.

Hon. Treasurer.

C. H. MOORE, } *Auditors.*
F. TAYLOR

REGULATIONS FOR THE ADMINISTRATION OF THE RESEARCH FUND.

1. The Research Fund shall be invested in the name of the Conchological Society of Great Britain and Ireland, and the securities shall be deposited with the Society's Trustees.
 2. The Fund shall be administered by the Council.
 3. The Income arising from the Fund shall be devoted to the advancement of the study of the Mollusca by aiding the prosecution of original research by such persons as the Council may in their discretion deem desirable, in any or all of the following ways :-
 - (a). The purchase of apparatus and materials required for such original research.
 - (b). The payment, in whole or part, of any labour employed or travelling expenses necessarily incurred.
 - (c). The preparation of drawings, photographs, or charts necessary to illustrate such research.
 - (d). The defraying of the cost, or part of the cost, of the publication of the results attained.
 - (e). And otherwise in the discretion of the Council.
- The applicant towards whose investigation help is granted must send all invoices, accounts, etc., to the Honorary Secretary of the Society in order that they may be paid directly by the Honorary Treasurer of the Society up to the limit of the grant authorised.
4. All apparatus and materials obtained by means of the grant shall remain the property of the Society and be forwarded to the Honorary Secretary as soon as the work is completed.
 5. Application for a grant must be made on a form to be obtained from the Honorary Secretary, and when filled in must be returned to the Honorary Secretary, who shall bring it before the Council at the earliest opportunity.
 6. The recipient of a grant shall furnish to the Council, on or before December 31st, in each year until the grant is exhausted, a report containing :—
 - (a). A brief statement showing the results arrived at, or the stage which the enquiry has reached.
 - (b). A general statement of the expenditure incurred.
 7. In general a paper giving the results of the investigation shall be communicated to the Society in a form suitable for publication in the Journal. But in case this is not practicable, from the nature of the paper or from other considerations, an abstract shall be given to the Society, and if the paper is published in fuller form elsewhere acknowledgment shall be made in it of the help given by the Fund and whenever possible two copies of the paper shall be presented to the Society's Library.

THE BRITISH ANODONTAS.

BY H. H. BLOOMER, F.L.S.

(Presidential Address, read before the Society, October 19th, 1929).

IN treating of the British Anodontas I have made use of notes extending over some years upon the forms of *Anodonta cygnea* and *A. anatina*. It, however, must be stated that some of the specimens referred to and exhibiting unusual features were collected years ago from localities that have changed since, or have been destroyed by the growth of towns or by the spread of industrial areas. Nevertheless there are to be found uncommon specimens in other areas which have not thus far lost so much of their natural conditions.

The varieties and forms of *cygnea*, according to the implied classification of the British Anodontas,¹ are generally thin-shelled. The typical shell of *anatina* is rather thin, and in passing from one variety to another a gradual increase in thickness is noticed; i.e. from the type to *piscinalis*, then to *ventricosa* and ending in *incrassata* or *ponderosa*,² the thickest of all. Not that it must be thought there is a clear demarcation in shell thickness between the different varieties. Even in the typical form as well as the varieties there may be a slightly changing degree of thickness and the feature may be seen as occurring in a single locality, or sometimes in closely related waters apparently the same ecologically.

Again it is further observed that the question of the thickness of the shell may be a physiological one and not altogether attributable to the quantity of lime salts in the water though of course this factor must have a bearing upon the shell-thickness, yet seemingly it does not appreciably affect the relative thickness when forms of the two species are present (Wychall Pool, Kings Norton, Worcs; canal, Bardsley; canal, Marple). It is possible to find thin-shelled *cygnea* or its var. *zellensis* with the thicker *piscinalis* or even with massive *incrassata* in the same water (Cadley Dam, near Preston; canal, Saltaire; Ossington Lake, Notts.), and this difference of thickness may be seen where there appears to be a comparative scarcity of lime salts (Hill Hook, Blake Street, Staffs.), whilst on the other hand where lime is evidently plentiful (traced from the deposits on the shells) examples of both *cygnea* and *anatina* groups are found to have comparatively thin shells (The Mere, Scarborough; Wicken Lode, Wicken Fen; R. Ant, Norfolk).

1. The classification of the British Anodontas is considered in a paper shortly to be read by H. Overton and myself.

2. For the purpose of this paper the *cygnea* group includes the varieties *zellensis* and *pallida* and the *anatina* group includes the varieties *piscinalis*, *ventricosa*, *intermedia*, *rostrata*, *incrassata* and *ponderosa*.

At least one form of the *anatina* group has a relatively thin shell up to a certain growth, and subsequently develops a thick one (Longmore Pool, Sutton Park, Warwicks. allied to the var. *piscinalis*, up to 6 cm.).

Again there may be a tendency for the shell to thicken in the anterior and ventral parts more than in the posterior portion; the feature is characteristic of *piscinalis*, is present in *ventricosa*, and is evidently intended by Sheppard as one of the features distinguishing *incrassata*.

In examining a number of specimens of a variety or form from the same water, one is at times impressed with a certain, probably uncommon, character, which seems to run more or less through the whole series (*cygnea* group, Pudsey, Yorks, a rounded dorsal surface; Hunston, Chichester, a dark and elongated shell with round anterior end; Greengates, Yorks, a deep rounded shell; *anatina* group, canal, Marple, rostrate form; pond, Whittingham Lane, narrow anterior end). Sometimes it is a peculiarity in the shape of the shell, possibly not very striking in one near the normal shape, but by arranging the specimens in order from near the normal to the extreme state, the development of the character can be observed—how it gradually assumes an unusual appearance and almost reaches an abnormal condition at the far end (form of *piscinalis*, Longmore Pool, Sutton Park, Warwicks.). The feature may be difficult to match with that of any other locality or may be found only in that particular place (probably of the *cygnea* group Pudsey, Yorks; a form of *cygnea*, Keepers Pool, Sutton Park, Warwicks; a form of *piscinalis*, Langley Pool, Warwicks.). Besides in young specimens there may be only a very slight indication of the character, which becomes more pronounced as the shell increases in size (allied to *piscinalis*, Longmore Pool, Sutton Park, Warwicks.).

In certain localities the colour of the periostracum is quite distinct, that is, it differs from the colouring ordinarily associated with the particular form. The variety *pallida*, Jeffreys, is a case in point, but it does not follow that this variety, which is probably the same as, if not so then akin to, *zellensis*, is the only one exhibiting the feature.

The paleness of colour seems to occur in certain localities (*cygnea* group, Weston Turville Reservoir, Bucks; Newport and Brecon canal, Llangynidr; near Ashley, Lancs.) and is found in the *anatina* group as well as the *cygnea* one (Langley Pool, Warwicks.). It may be a light colour on the umbonal and adjoining surface with a much darker shade or another colour on the anterior and posterior parts (var. *piscinalis*, pond, Old Hill, Staffs.). As a contrast the colour may

be much darker than usual (*cygnea* and *piscinalis*, pond, Chesterton, Warwicks. ; allied to *zellensis*, Hunston, near Chichester ; Drinkwater Park, Prestwich ; allied to *cygnea*, Greengates. Leeds). It may pick out some of the concentric bands (pond, Cadley, nr. Preston ; River Foss, Yorks. ; Bradford Canal, Shipley, Yorks.) ; sometimes in a conspicuous manner it is enhanced by the raised concentric lines of growth (allied to *piscinalis*, Budworth Mere, Cheshire), and one is conversant with the radial colour lines from which the var. *radiata* takes its name, but the character of the last mentioned is not confined to this variety alone, as it occasionally occurs in other forms of both the *cygnea* and *anatina* groups. The periostracum often assumes a darker shade with the increased growth of the shell, and now and then is so changed that one would scarcely associate an old with a young specimen (var. *incrassata*, Valley Pond, Scarborough).

In young *Anodontas* the sides of the ligament are hidden from view by the shell, but as the shell increases in size the part bordering the ligament is broken off or rubbed away ; this may continue only in a limited degree, or may become wide-spread and ultimately lead to a large exposed ligament.¹ This is particularly observable in some of the *anatina* group.

If the hardness of the water were known from which specimens have been collected it would prove very useful in finding its relationship to the growth of the shell of some forms. In the same way it might help to explain the reason of the comparatively thick shells from waters thought to be soft.

Professor A. E. Boycott has thrown considerable light upon this matter in his investigation of the River Wye, near Hereford. There he states "in the bank of the river valley are a number of hard water springs which give the necessary supply of natural hard water"² whereas the main stream is more or less soft. Specimens³ from the River Ithon at Penybont belonging to the *anatina* group have a comparatively thick and solid shell, and there the water flows from the high moorlands in the north ; a thick tumid specimen allied to *piscinalis* from Dupplin Lock, Perthshire ; and a number of interesting shells also allied to *piscinalis* collected by Mr. Charles Oldham from the River Wick, Caithness ; these have a thick shell, eroded in the umbonal and central parts, with a brown to brownish-black periostracum, and more or less tinged with a reddish-brown stain.

1. In this connection reference should be made to an instructive paper by T. H. Haynes "Notes on Shell growth and the process of hinge formation," *Pro. Malac. Soc.* Vol. XVII. pt. 1, April, 1926. Dr. Jackson has reminded me also of the paper by M. C. March on "Studies in the Morphogenesis of certain Pelecypoda," *Mem. Pr. Manchester Lit. & Phil. Soc.*, 1911.

2. Professor A. E. Boycott, appendix to J. W. Jackson's presidential address "The distribution of *Margaritana margaritifera* in the British Isles," *Journ. of Conch.*, vol. 17, March, 1925, p. 210.

3. A collection made, and kindly sent me, by Mr. J. Watts, now superintendent and manager of the Welsh Dee Fishery Board.

As before stated it is often possible to detect the presence of lime in the material forming the habitat by the deposits on the shell¹—the factor has been made use of in some of the deductions drawn.

Further, the presence of large quantities of lime in the river or lake bed renders it plastic, and under this condition the umbonal part of the shell is generally intact and clearly shows the rugæ, consequently the periostracum is not subject to abrasion in the same manner as where only gravel or coarse material covers the river or lake bottom.²

It also should be observed that the larger specimens taken from pools where there is a depth of mud often exhibit erosion in the umbonal part; however, this has reference to places where the underlying bed is not of a calcareous nature but composed of gravel or coarse material.

Personal observations tend to the conclusion that the *cygnea* group where possible seeks a different habitat to the *anatina* one, even where examples of both are present in the same water; that the *cygnea* group seems to choose the softer or muddier parts, and the *anatina* one the more stony places. Specimens collected from a stretch of the Newport and Brecon canal at Llangynidr showed this to be the case, and *cygnea* and *anatina* were not found together. The distance between the two kinds in places was not far, but the colonies were not found mixed. This tendency to occupy different habitats I have noticed in some pools in the midlands, and in 1917 the late P. T. Deakin informed me that it was his experience. Such choice would partly explain why typical *anatina* and some varieties are usually more eroded in the umbonal region than *cygnea* and its varieties. Whether the two species have a separate habitat all the year round is uncertain, e.g. during spawning time; as a rule during the summer months both frequent shallower water and generally move towards the sides of the pool whereas in the winter they return to deeper water.

Piscinalis is probably the most common and distributed form of the *anatina* group and appears to be more prone to variation. This is quite pronounced in certain localities (Longmore Pool, Sutton Park, Warwicks.) though in some cases there is consistency of shape and very little variation is shown (Earlswood Pools, Worcs.). Further it is observed that in certain districts a number of the pools possess forms differing from pool to pool, each where such differences occur being characterised by some distinctive feature (Sutton Park, Warwicks. and adjoining neighbourhood).

1. Conchologists who are interested in the chemical and physical factors will find them dealt with in detail and in a very able manner by Professor A. E. Boycott in his anniversary address to the members of the Hertfordshire Natural History Society in 1918 on the "Freshwater Mollusca of the Parish of Aldenham," also K. E. Carpenter "Life in Inland Waters" published by Sidgwick & Jackson.

2. It is scarcely necessary to point out that so long as the periostracum remains intact there is no erosion of the shell, notwithstanding the presence of carbonic acid in the water; or that friction with coarse material may not only remove the periostracum but wear away the shell.

Between typical *anatina* and *piscinalis* are forms which it is difficult to say if they should be classified with typical *anatina* or the variety *piscinalis*. *Cygnea* on the other hand is not quite so liable to variation, nevertheless, in some waters where *zellensis* is the prevailing form there may be found specimens varying in shape from near a typical *cygnea* to the var. *zellensis* (Bracebridge Pool, Sutton Park, Warwicks.). In other waters where both *cygnea* and *piscinalis* are present the former may be fairly stable whereas the latter may show considerable variation (Longmore Pool, Sutton Park, Warwicks.).¹ Then again within certain limits, area would not seem to be the determining factor in which the changes occur, though probably these variable forms are more confined to the southern, central and the south-northern parts of England, whilst in the eastern part of Wales and portions of the adjoining English counties are forms of *anatina* which possess some of the shell characters of *cygnea* and have external anatomical characters more analogous with the forms east of that region.

Piscinalis appears to have attained its maximum variation in lakes, pools or quieter waters; besides it is suggestive that through *piscinalis* have arisen the forms known as varieties of *anatina* (*ventricosa*, *incrassata* and *ponderosa*). Also apart from these varieties there are forms undescribed, which are, as far as the shell is concerned, quite of a distinctive nature. In fact the difficulty in naming shells from many localities is in placing them under any of the recognised varieties, and in assigning them to the *anatina* group the arrangement of the umbonal rugæ in some cases has been the deciding factor. One illustration of this may be given. Of a number of shells of the *anatina* group, collected by Mr. Charles Oldham from the Grand Junction canal at Wilstone, Herts., one kind may be classed as *anatina piscinalis* and the other *piscinalis*? Both forms have distinct characters in the shape and colouration of the shell, and though taken in separate places—the former in the Aylesbury branch and the latter in the main canal—were about one and a half miles from each other.

It should, however, be remarked that there are shells from certain localities having eroded umbonal areas, which I am unable to say definitely whether they should be classed as belonging to the *cygnea* or *anatina* group.

A typical *cygnea* in the external characters of the animal appears to be more akin to a typical *anatina* than the variety *zellensis* is to the variety *piscinalis*, consequently whether the two former are more closely related than the two latter, or whether the case is one of convergence

1. H. H. Bloomer and H. Overton on *Anodonta cygnea*, *A. anatina*, and *Pseudanodonta rothomagensis*, Proc. Malac. Soc. Vol. xii pt. v, August, 1917.

it is not possible to express an opinion without a fuller acquaintance with the continental forms.¹ Nor would it be wise to attempt any correlation between anatomical and shell characters.

Then again the question arises does hybridisation ever occur? In some instances, and under certain conditions, the shape of the shell as well as the irregularity of the umbonal rugæ seem to point to this as a probability.

A noticeable thing is that certain forms are found in different and sometimes widely separated localities, without, as far as I have evidence, such forms being found in intermediate places. Such discontinuous distribution is seen in the massive varieties *incrassata* and *ponderosa* (*incrassata* at Valley Pond, Scarborough; Ossington Lake, Notts.; Rounton Grange; *ponderosa* at Cheadle, Staffs.; Bosworth Field, Leicestershire; Birch, Lancs.).

In this respect parasitism must be considered and whether all the *Anodontas* are parasitic on the same kind of host. Only a limited amount of work has been done on this group, and there is doubt whether parasitism is confined to certain fish; it might be worth while investigating if tadpoles or some of the crustacea, such as the fresh-water shrimp and crayfish, may not at times act as host.

If it could be proved that some of the forms of *Anodonta* have arrived at a point in their evolution when they pass the parasitic period only on certain hosts, in the same manner that has been indicated in the American freshwater mussels² then the absence of the necessary host from some waters may explain the limited distribution of certain forms.

The following study may prove interesting, but I must first say that I am indebted to Mr. W. Gyngell for the use of the specimens, and for information concerning the ponds. The investigation is confined to The Mere and Valley Pond near Scarborough; and Hilla Pool close to the River Derwent. The Mere (roughly 300 yards long by 70 yards wide) situated about one and half miles from Scarborough and fed by a small stream, which continues on its way through the "Valley" and a third of a mile from the sea forms the Valley Pond (roughly 80 yards by 40 yards).

By the deposits on some of the shells it is inferred that lime to some extent enters into the composition of the beds of both pools, probably more so in the case of the Valley pond. I have examined five

1. Ortmann writing on the *Anodontas* of Central Europe states that "the form of *zellerensis* is surely only the senile form of ponds, and *anatina* is the form of small creeks." Notes upon the families and genera of the Najades—Annals Carnegie Museum, Vol. VIII. No. 2, 1912, p. 286.

2. Thaddeus Surber, Notes on the natural hosts of Freshwater Mussels 1912 No. 778, and Identification of the Glochidia of Freshwater Mussels 1912 No. 771, and 1915 No. 813 U.S. Bur. Fisheries Washington.

specimens from The Mere; the largest 14.4 cm. long¹ is a typical *cygnea* with umbones only slightly worn, otherwise a nice clean shell of green, a little yellow, and dark olive colour; the second is 12 cm. long, has for its size a very thin shell with green as the dominant colour. It is a beautiful thin-shelled specimen with the umbones intact, and from the arrangement of the rugæ and other characters belongs to the *anatina* group; in fact it is the best specimen I have seen which corresponds to my interpretation of the description of the variety *intermedia*; the third 8.7 cm. is also a nice clean-coloured specimen, relatively heavier than the preceding one and is of the var. *piscinalis*; the last two about 6.4 cm. are also of the *anatina* group, but whether they would ultimately have developed into the variety *piscinalis* or *intermedia* is uncertain.

In the Valley Pond nothing but the so-called variety *incrassata* is found. There are 17 specimens, ranging from 13.9 cm. to 7.7 cm. The largest ones have reddish-brown umbones, and from thence increasing in intensity of the brown colour, with olive brown and, towards the posterior end, more tinged with green. The younger ones have much more green in the posterior part. The larger ones are more regular in shape, but five of the smaller ones are more varied, of which two are truncated posteriorly and three malformed, one apparently by injury, but the cause of the remaining two is not clear. The most striking feature is the large umbonal region and where it is of a lighter colour is very conspicuous.

Some distance away from Scarborough there is a pool called Hilla Pond formed by an overflow of the river Derwent, and the five specimens from it have their umbonal parts much eroded. The shells are of a coarser build and not so thick as the Scarborough *incrassata*, but all are malformed at the posterior end. The specimens suggest that they represent the form from which *incrassata* originated, unless they are a degenerate form of *incrassata*. I am inclined to the former view.

From the foregoing it will thus be seen that *cygnea* and at least one form of *anatina*, not thick-shelled, are present in The Mere, and that in the Valley Pond a little distance away, and having a water connection with The Mere, is found only one kind, *incrassata*, and that a massive form.

In addition to those already mentioned I wish to thank the following for information or use of specimens, P. Arnold, J. E. Cooper, Dr. W. T. Elliott, Dr. F. Haas, A. Hartley, Dr. J. W. Jackson, J. W. Moore, H. Overton, A. Seidler and B. B. Woodward.

1. Length refers to antero-posterior measurement.

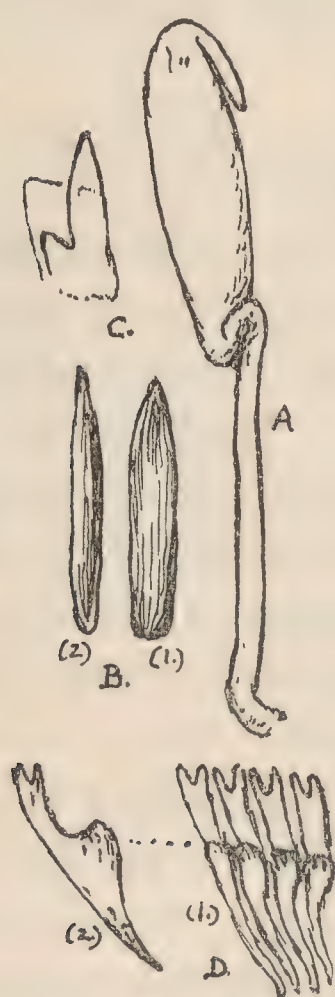
THE RELATIONSHIP OF *IBYCUS SIAMENSIS* Ckll.

BY PROF. T. D. A. COCKERELL.

(Read before the Society, February 5th, 1930).

WHEN, in 1891 (Ann. Mag. Nat. Hist., Jan., p. 107) I described the slug *Ibycus siamensis* from two specimens in the British Museum, I little imagined that I should be the next one to collect this species, thirty-seven years later!

I found it at Nan, Siam, Dec. 28, 1927. From a living specimen I made the following description:—



Giresia siamensis

Length about 45 mm.; rugose, dark grey; upper tentacles grey, lower whitish, speckled with light grey; a pair of converging dark dorsal stripes, about 2 mm. broad, at the sides of the pale slightly elevated keel; mantle with a lateral pale elevated line, and a dark band above respiratory orifice; aperture showing shell about 7 mm. long, shell pale yellowish, very broad (8.5 mm. long and 7 broad), scale like, posterior margin membranous, anterior margin irregular, chalky white, rest of shell shining corneous (these shell characters only seen when the slug has been killed and the shell removed); margin of foot alternately speckled light and dark; sole very pale yellowish grey; caudal gland strongly developed; anterior part of body (neck) with a dark band on each side, but dorsally and above the foot pale yellowish; anterior part of head pale yellowish, longitudinally grooved; sides of body above foot pale, lightly speckled.

To begin with, this animal is not closely related to *Ibycus*, and should never have been placed in that genus. Collinge (Journal of Malacology, Dec. 1900, p. 180) came much nearer the truth when he referred it to *Parmarion*. It has, however, some rather striking anatomical characters. The dart gland is an elongated cylindrical structure, with a downwardly curved process at the end, and at the base suddenly reflexed before it joins the long slender pedicel or sac, the whole structure suggesting a large anther on its filament. The dart is pale brown (dark brown when dry), corneous, not at all calcareous, narrow and parallel sided but flattened, pointed

FIGURES.

- A. Dart Gland. B. Dart; side view in 2. C. One of the first lateral teeth.
D. Marginal teeth, a side view at 2.

apically, very obtusely rounded at base. The lingual membrane is oval in outline, about 4 mm. long and 2.5 broad. The median teeth are ordinary, but small and slender. The laterals lack the endocone, and the ectocone is very short, the mesocone being proportionately much longer than in *Girasia*. The marginals are closely set, bidentate apically, and formed practically as in *Girasia*.

Seeking a near relative, I find it only in *Parmarion intermedium* Collinge, P.Z.S., 1897, p. 779. This comes from Lombok, which is not in Borneo, as Collinge then supposed. I passed Lombok on the way to Australia, in March 1928, and greatly regretted that I could not land.

Parmarion intermedium agrees in the general form of the slug, in the extremely reduced non-spiral shell, and in the remarkable corneous dart. This type represents an extreme development of a line leading from forms with helicoid shells, such as *Khasiella*, through *Girasia*, to a group with the shell reduced to a scale-like form, and the dart corneous. It is allied to Simroth's *Microparmarion*, but that has the dart partly calcareous. Whether we should recognise a series of genera, or merely a number of subgenera of *Girasia*, is perhaps a matter for legitimate differences of opinion. At present, I will propose *Cerataconta*, new subgenus, for *P. intermedium* and "*Ibycus*" *siamensis*, taking the former species as the type, because its anatomy has been rather fully figured and described. The two species may then stand as:

Girasia (Cerataconta) intermedia (Collinge).

Girasia (Cerataconta) siamensis (Cockerell).



THE GENUS *HEMISTOMIA* Crosse IN NEW CALEDONIA.

BY PROF. T. D. A. COCKERELL.

(Read before the Society, December 4th, 1929).

IN 1871 Crosse described a genus *Hemistomia*, based on a species, *H. caledonica* Crosse, received from New Caledonia. The shell had much the aspect of a *Rissoa* or *Rissoina*, somewhat less than 3 mm. long, fusiform, fairly robust, with about five rather swollen whorls, pellucid white when fresh. The most distinctive feature was in the aperture, which was large, broadly rounded externally, obliquely placed, and with an entire thickened peristome. It was considered probably fluviatile and at a latter date the freshwater habitat was definitely confirmed by Marie, a well-known conchologist resident in New Caledonia.

Since the original description, authors have had little to say about this genus, and opinions have differed as to whether it belonged to the *Rissoidæ* or the *Amnicolidæ* (*Hydrobiidæ*).

In river drift near the sea coast, a few miles from Bourail, New Caledonia, I found a great quantity of small land and freshwater shells, and among them specimens of *Hemistomia*. On going over this material I find there are two quite distinct species, separable thus:

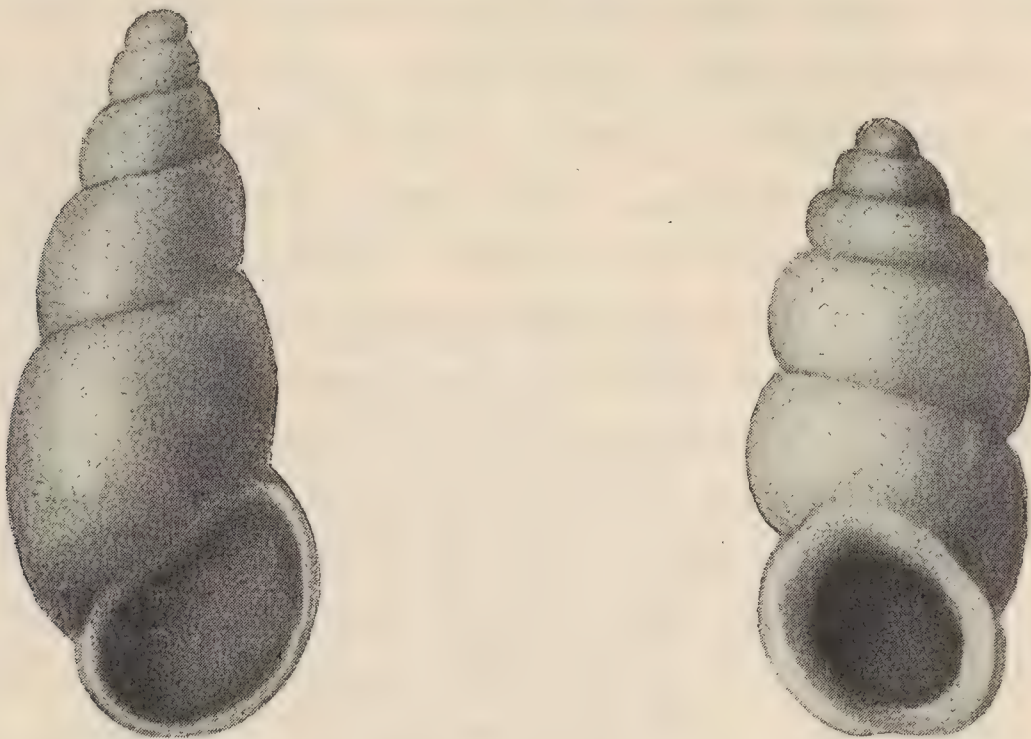


Fig. 1—*HEMISTOMIA FLUMINIS* n.sp. Fig. 2—*PALAINA MONTROUZIERI* var. *HUMILIOR* n.

Hemistomia caledonica Crosse. Shell about 2.9 mm. long, about 1.2 broad above the aperture, aperture about .9 mm long and .65 wide. White, moderately shining, rather robust, aperture forming rather more than half a circle. Crosse did not know the operculum but I saw it in a specimen in the Australian Museum at Sydney; it is of an orange colour.

Hemistomia fluminis n. sp. (fig. 1). Shell about 2.3 mm. long, about .7 broad above the aperture; aperture about .57 mm. long and .35 wide. A much smaller, more slender, subcylindrical shell, but with the same texture and type of aperture. Noticing a certain resemblance in form to the African *Syrnolopsis lacustris* E. A. Smith, I broke open a shell to see if there might be any trace of a spiral fold or keel on the columellar axis, but nothing of the kind exists. There is no umbilicus, but the heavy inner lip is separated from the whorl back of it by a groove.

A New Operculate Land Snail from New Caledonia.—*Palaina montrouzieri* (Crosse) var. *humilior* n. var. (fig. 2). Length about 1.6 (rarely as much as two) mm., diameter above aperture .8 mm.; five convex whorls, and the aperture circular, with continuous lip. River drift near coast a few miles from Bourail, New Caledonia (Cockerell). Found with *P. montrouzieri* (Crosse), which is a similar shell 2.5—2.7 mm. long, 1.2 mm. broad. This cannot be *P. (Cylindropalaina) mariei* (Crosse), which is 2 mm. long, but is less swollen, with much fatter whorls, and suboval aperture. It is perhaps a distinct species, and the occurrence of *montrouzieri* and *humilior* in the drift together does not prove that they lived at the same spot.—T. D. A. COCKERELL (*Read before the Society*, Dec. 4th, 1929).

ON THE STATUS OF PENION Fischer.

BY WILLIAM J. CLENCH.

(Read before the Society, Dec. 4th, 1929).

FISCHER, Manuel de Conchyliologie, 1884, p. 625, established the subgeneric name *Penion* to include many of the Austro-neozelanic species that had been known under the genus *Siphonalia*, naming *Siphonalia dilatata* Q. & G. as the type of his new subgenus.

Iredale, Proc. Malac. Soc., Vol. x, 1912, p. 223 accepted this as of generic rank but later, in the same Proceedings, Vol. xi, 1914, p. 175 rejected the name *Penion* and substituted *Verconella* on the grounds that *Penion* was a homonym of *Penium*, Philippi, 1865, as both were derived from the same Greek root. Iredale stated that the International rules allow an emendation when there is an obvious error in transliteration. *Penion* is a direct transliteration from the Greek and *Penium* is a latinized form of the same word, but the International rules¹ state that a name is NOT to be rejected on this account. . . . "It is well to avoid the introduction of new generic names which differ from generic names in use only in termination or in a slight variation in spelling which might lead to confusion. But when once introduced, such names are not to be rejected on this account."

The restoration of *Penion* Fischer, will replace *Austrosipho* Cossmann, wholly or in part as outlined by Finlay, Trans. & Proc. New Zealand Inst. Vol. 57, p. 504, 1927.

¹ 1926, International Rules of Zoological Nomenclature, Proc. Biol. Soc. Washington, Vol 39, p. 87, Article 36

ADDITIONS TO THE MOLLUSCA OF ALBERT NYANZA.

BY M. CONNOLLY.

(Read before the Society, February 5th, 1930).

SINCE my previous paper on this fauna¹ Captain C. R. S. Pitman has found opportunity to make more than one further visit to Lake Albert, including the famous Kaiso bone beds, resulting in the addition to my former list of a few fresh species, both recent and fossil, of sufficient interest to merit immediate publication.

(a) RECENT SPECIES.

All of these were collected near the mouth of the River Sonso, which flows into the lake N.E. of Butiaba, and since they have not occurred in any other locality in the lake, may possibly be recent immigrants from up country.

PLANORBIDÆ.

Genus *Planorbis* Geoffroy, 1767.

Planorbis costulatus Krs.

1848 *Planorbis costulatus* Krs., Südafr. Moll., p. 83, pl. v, f. 8.

This species has not been recorded from this part of Africa, but has been collected by Pitman in a pool S. of the R. Aswa, S.W. of Paranga, in Uganda, and in Kenya Colony by Percival at Urguess.

Genus *Segmentina* Fleming, 1818.

Segmentina planodiscus (M. & P.)

1897 *Planorbis* (*Segmentina*) *planodiscus* M. & P., A.M.N.H., xix, p. 638, pl. xvii, f. 10.

A local species, only recorded hitherto from Natal and S.W. Africa, the latter on very doubtful authority. It is remarkable for the large number of septa that occur in many specimens, there being 7 in the last half whorl of one of my shells from Durban, and 6 in the largest from Lake Albert; the peripheral angulation is near the base and rather blunt. Pitman's series are rather paler, but agree in all other respects with the typical form.

Segmentina kanisaënsis Prest.

1914 *Segmentina kanisaënsis* Prest., Linn. Soc. J., xxxii, p. 265, pl. xviii, f. 17-19.

Another very local species, described from the Sudan, but also collected by Dr. F. G. Cawston at Merebank, Natal. It is entirely different in its stronger carination and spiral sculpture from *S. planodiscus*, yet it is remarkable that these two should be found in conjunction near each other in localities so remote as the Durban

¹ J. of C. xviii, 1927, pp. 171-179 and 205-208.

district and Lake Albert. Pitman's series is not in perfect condition, and may prove to be undescribed, but, without further knowledge, I would not separate them from Preston's species.

Genus **Bulinus** Müll., 1781.

Bulinus forskali (Ehrn.)

1831 *Isidora forskalii* Ehrn., Symb. Phys., Evert., 3rd Species.

Two typical examples, showing extremely strong, spaced costulation.

(b) FOSSIL SPECIES.

VIVIPARIDÆ.

Genus **Viviparus** Montf. 1810.

Viviparus sp.

Text figure 1 represents, in actual size, a group of this genus in a water worn pebble from the Kaiso shore of the lake.



Text fig. 1.—Casts of VIVIPARUS from E. Shore of Albert Nyanza at Kaiso.

THIARIDÆ.

Genus **Thiara** Bolten, 1798.

Thiara brevissima Cox.

1926 *Thiara brevissima* Cox, Geol. Palaeont. Kaiso, p. 58, pl. viii., f. 1-3.

Whether due to natural growth or weathering, this species is nearly always found with a much truncated spire, as figured by Cox, but occasional examples occur with a perfect, fully formed spire, in which case they attain an altitude of about 20 mm. and present an extremely attractive appearance.

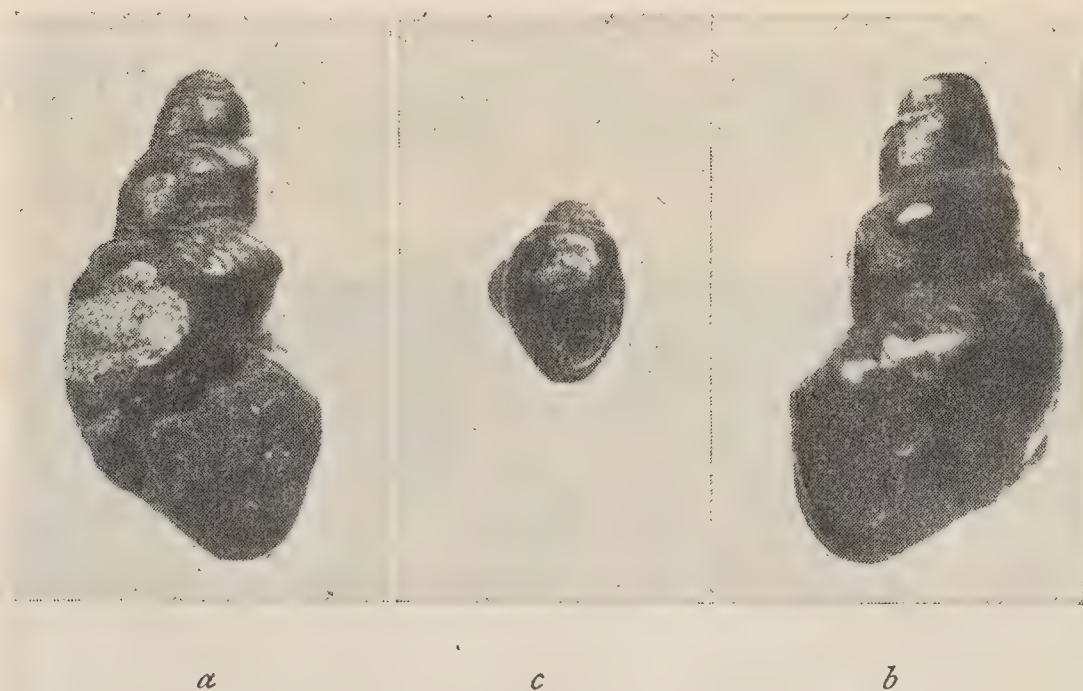
Genus **Potadoma** Swainson, 1840.

Potadoma ganahli sp. n.

Text figure 2.

Shell large, gradate turritiform, rimate, smooth. Spire produced, sides gradate, apex rounded. Whorls 5, regularly increasing, angulate and tubercled at the shoulder, the sculpture, when visible, consisting of close, nearly straight, oblique striæ; suture impressed. Aperture roughly triangular, somewhat angled and very narrowly rounded at the base.

Long., 35.0, lat. 18.2; apert. alt., 15.1, lat., 12.2; last whorl 24.0 mm.



Text fig. 2a, b.—**POTADOMA GANAHLI** Conn. (type) $\times 1$.

„ „ *2c.* ditto, a young example showing aperture and tubercle (Kaiso bone beds).

Hab. Uganda. Kaiso (Pitman).

Type in my collection.

The distinctive feature of this species is the remarkable, coarse, broad tuberculation around the angled shoulders of the median whorls, beginning usually on the 3rd or 4th and becoming weaker or absent towards the aperture; at Captain Pitman's request I have much pleasure in naming it after Mr. C. F. de Ganahl, in recognition of his invaluable assistance during the expedition.



LOCOMOTIVE HABIT OF *DREISSENA POLYMORPHA*.

By C. OLDHAM.

(Read before the Society, November 6th, 1929).

DURING the long drought of last summer the water-level of the large canal reservoir at Wilstone, near Tring, was some ten feet below the mean of recent years, and large numbers of Zebra Mussels were left high and dry on the face of the retaining walls.

In places near the embankments there are considerable quantities of *Potamogeton lucens*, normally in deep water, but readily accessible in September when many small mussels were seen to be attached to the leaves and long stems. These comprised two groups, one of shells from 2.5 to 4 mm. long, the other of shells of 10 to 16 mm., the difference in size possibly indicating a difference in age of about a year. As neither the leaves nor stems of the *Potamogeton* are permanent it seemed clear that sooner or later the mussels must either shift their position or die, and to test the matter some of the *Potamogeton* with mussels adhering to it and an *Anodonta* on which was a cluster were placed in a shallow basin. Within forty-eight hours nearly all the mussels on the *Potamogeton* and several of those on the *Anodonta* had detached themselves, abandoning the byssi by which they had been moored, and had crawled, in some cases for several inches, along the bottom and sides of the basin. Some of them had already anchored themselves by fresh byssi. Subsequent observation showed that full-grown mussels of 27 to 30 mm. which had been forcibly detached from stones in the reservoir travelled for several inches in an aquarium before secreting a byssus and mooring themselves anew. The foot decreases in size proportionately with the size of the mussel and, as might be expected, the older were less active than the younger animals. Eighteen of the smaller group (2.5 to 4 mm.) were detached from *Potamogeton* stems and placed in a small aquarium of a depth of four inches and a half. In less than an hour most of them had crawled up the sides of the aquarium and several were creeping in an inverted position on the under side of the surface film, the foot being extended and the shell then pulled up to it with a jerk. During the next few days most of the little mussels secreted byssi and settled down either on the glass or on leaves of *Elodea* to what was, for the time at any rate, a sedentary life, but after seventeen days three were seen to be still active and creeping on the surface-film. The arena of the little mussels' activities was not restricted to the sides of the aquarium and the surface-film, for on

many occasions one or more were seen depending from the surface-film by mucous threads, the point of attachment of the thread being indicated by a tiny capillary depression.

No mussel was seen to secrete a thread long enough to enable it to reach the bottom of the aquarium or any intervening object—the longest observed was 15 mm.—but the way in which the mobile foot was waved to and fro, whether the mussel was dangling at the end of the thread or was ascending it in order to regain the surface-film, suggested that the creature was feeling for some stable and secure resting place.

EDITORIAL NOTES.

WE commend the following letter from a member of very old standing to all whom it may concern:—

51, HOLLY AVENUE,
JESMOND,
NEWCASTLE-ON-TYNE.

Dear Mr. Editor

Feb. 3/30.

By the request of the Northern Naturalist Union (comprising most of the Northern E. Field Club above Yorkshire) I am compiling a list of Land and Fresh Water Mollusca for the counties of Northumberland and Durham—Nos. 66, 67, 68. There has been no complete List since Alder's in 1848. The List is well on the way but I am anxious to secure records from men who have visited these counties or have had specimens sent to them, who are outside of our area. Very little work has been done here for years and the workers are very few.

I should be grateful if you can make a note in the Journal of Conchology to the effect that I want any records that could be supplied.

Sincerely yours,

(Rev.) E. PERCY BLACKBURN.

The Royal Irish Academy has just issued in its Proceedings a valuable paper by Miss Massy on the Mollusca of the Irish Atlantic Slope, based mainly on the dredgings of the Fisheries Branch of the Dept. of Agriculture, the Cephalopods and certain other groups being excluded. In order to exclude common littoral species the 50-fathom line is chosen as the minimum depth, and as a maximum Canon Norman's dictum of the 1,500-fathom line is followed. Species taken east of the Fastnet Light are also excluded. In all 313 species are enumerated as taken between 49° N. lat. and 56° N. lat.

We should have liked to see the nomenclature brought more up to date, especially by the elimination of Chemnitz names.

Mr. R. Garraway Rice sends me some interesting particulars of a case of accidental dispersal by motor-car. It appears that in August, 1928, a Mr. Goodsell, who was formerly a member of the railway staff at Pulborough Station, found eight small examples of *Cochlicella barbara* adhering to a Brighton doctor's car at Pulborough. The specimens came into Mr. Rice's hands, and as he had never found the species in the Pulborough district, he thought it was worth while to follow

the matter up. Enquiry of the doctor elicited the fact that he had been at Peacehaven a day or two before and had left his car standing there for several hours in a grassy place. Now Peacehaven is one of the Sussex localities where Mr. H. S. Toms, of the Brighton Museum, has turned up *C. barbara*. and the presumption is very strong that these Pulborough examples had travelled there by car.

We gather from cuttings from the "Belfast Telegraph," kindly forwarded by Mr. R. J. Welch, that the increasing accumulation of *Mytilus edulis* in the vicinity of the Belfast Harbour Electricity Station in recent years has become a serious nuisance and cause of expense. In 1928 and 1929 the department removed by mechanical means about 500 tons of mussels and marine growths from their culverts. It is dangerous to kill the mussels after they have attained any size as they become detached and seriously obstruct the water system.

The littoral form of mussel in Belfast Lough is larger and of the usual purplish colour, whereas those in the culverts are said to be thinner on account of quicker growth and much more prettily marked, similar to the form found commonly on barges in the R. Mersey.

We are delighted to receive an addition to the far too scanty series of faunal lists in the shape of M. Dautzenberg's "Mollusques Testacés Marins de Madagascar" (Faune des Colonies Françaises III, pp. 321-636, plates iv-vii, 1929).

The author published a preliminary list of 587 species in the Journ. de Conch. LXVIII, 1923; the present catalogue raises this total to no less than 909 species. What we now want most of all is a complete, critical catalogue from Indian waters. Lynge many years ago gave us an admirable work on the Pelecypoda of the Gulf of Siam, but the Gastropods, etc., have never appeared to complete the survey.

Speaking of faunal lists we should like to call attention to a small series of unpretentious notes which is appearing from time to time in "Miscellanea Zool. Sumatrana" on marine shells from N.E. Sumatra, by Dr. C. H. Oostingh.

So far the following have been dealt with: no. x (1927), Neritidæ; no. xv (1927), Littorinidæ, Naticidæ; no. xxv (1927), Cypræidæ; no. xxviii (1928), Conidæ; no. xxxiii (1928), Turbinidæ, Angariidæ, Trochidæ; no. xxxix (1929), Strombidæ, Amphiperasidæ; no. xlv (1930), Volutidæ, Marginellidæ, Olividæ.



PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN & IRELAND.

576th (Annual) Meeting, held at the Manchester Museum, October 19th, 1929.

The President, Mr. H. H. Bloomer, F.L.S., in the chair.

Amongst those present were the following :—Messrs. R. J. Welch, R. Garnett, C. H. Moore, A. K. Lawson, E. D. Bostock, C. Oldham, J. Digby Firth, G. Fysher, H. Overton, Fred Taylor, G. C. Spence, J. Davy Dean, Drs. A. E. Boycott and J. Wilfrid Jackson, Mrs. A. E. Gill, Mrs. E. N. Morehouse, Mrs. Wilfrid Jackson and Miss Jackson.

Appointment of Scrutineers.

Messrs. Fred Taylor and H. Overton were appointed Scrutineers.

Appointment of Auditors.

Messrs. C. H. Moore and Fred Taylor were appointed Auditors.

New Members Elected.

Hans Leo Dabbert, Noel Brydie Davis, Hans Modell.

Candidates Proposed for Membership.

Miss Anne Bryant, B.Sc., University College (Zoology), Newport Road, Cardiff (introduced by J. Davy Dean and Dr. J. Wilfrid Jackson).

Thomas George William Fowler, B.A., c/o Messrs. Lithgow & Pepper, 41, Wimpole Street, London, W. 1 (introduced by J. Davy Dean and Dr. J. Wilfrid Jackson).

Presidential Address.

The President delivered an address on "The British Anodontas," and a cordial vote of thanks to him was passed unanimously for his address, his services during the past year, and especially for having established a Research Fund with a generous donation of £100 (see Annual Report, p. 29).

A vote of thanks was also accorded to the Authorities of the Manchester Museum for the use of rooms for the Annual Meeting and the usual monthly meetings.

Election of Officers and Council.

The Officers and Council for 1929-30 were unanimously elected as nominated (see p. 1).

Exhibits.

By Mr. G. C. Spence :—Eucalodiidæ and Urocoptidæ.

By Mr. A. K. Lawson :—Selected specimens of distorted *Limnæa stagnalis* taken Oct. 13th, 1929, from a pond near Ashley Mill, Cheshire : bi-labiate *L. stagnalis* and scalariform *Planorbis* from same pond, May 26th, 1929.

By Mrs. Gill :—Smaller species of *Cypræa* including several rare forms.

By Mr. C. H. Moore :—Large series of *Camæna*.

By Mr. C. Oldham :—Very small examples of *Dreissena polymorpha* from reservoir near Tring.

By Mr. F. Taylor :—Series of British Zonitidæ, with eggs, newly-hatched young, and adults of several species. The eggs of the Sub-genus *Helicella* (*draparnaldi*, *cellaria* and *rogersi*) are perfectly spheroidal, while those of the Sub-genus *Retinella* (*nitidula* and *pura*) are a long oval. Also series of *Goniodiscus rotundatus* with non-calcareous eggs and juveniles : large *Vitrina pellucida* from Marple Aqueduct ; *Ceciloides acicula*, taken alive at Miller's Dale, and *Vallonia excentrica* from Romiley, Cheshire.

By Mr. R. J. Welch :—*Anodonta* from various localities.

By the Manchester Museum :—Large *Anodonta* from Claughton Hall, Garstang, Lancashire.

The "Chas. Oldham" collection and the "J. Kidson Taylor" collection, belonging to the Society were also on exhibition.

ANNUAL REPORT.

THE present is the Fifty-third Annual Report of the Society. At the last Annual Meeting the membership was 237. Since then the Society has lost four members by death, one by resignation, and two have been struck off the roll under Rule 4. Eleven new members have been added during the year just ended. The present membership is now 241.

The losses, by death, sustained by the Society are Edward J. Elliot, J. C. Dacie (Secretary of the London Branch), J. A. Hargreaves, and E. F. Wesley.

The usual monthly meetings have been held at the Manchester Museum, by the continued kind permission of the Authorities.

Nineteen papers and notes have been read and several have since been published in the pages of the Journal.

The Special Exhibits during the last twelve months have been : *Cypræa tigris* and *C. vinosa*, *Trochozonites*, *Selenites*, *Pomatias*, *Trochomorpha*, Reversed British Land Shells, and *Helicarion*.

Three numbers of the Journal have been published since the last Annual Meeting, viz. : vol. 18, No. 9, December 1928 ; no. 10, April 1929, and no. 11, July, 1929, comprising 86 pages of text, three plates, and eight text figures.

Soon after the last Annual Meeting, the President, Mr. H. H. Bloomer, F.L.S., submitted for the approval of the Council a proposal for the establishment of a Research Fund. This was carefully considered at several meetings of the Council and Laws regulating such a Fund were drawn up and submitted by post to all members of the Council with a request for comments or approval. Certain minor alterations were recommended and the Laws have been finally adopted.

The President, Mr. H. H. Bloomer, F.L.S., has opened the Fund with a donation of £100, and a further £100 has been received from an anonymous donor. The money has been invested in Government Stock.

It is hoped that the Fund will receive the generous support of the members in order that the income from the invested money may render it possible for substantial grants to be made.

It is very gratifying to record that the Manchester University, in July last, conferred the degree of Doctor of Science on the Honorary Secretary for his many researches in geology, zoology, ethnology, prehistoric archæology, etc.

On October 17th, the Honorary Secretary attended the Centenary Celebrations at Newcastle-upon-Tyne of the Natural History Society of Northumberland, Durham and Newcastle-upon-Tyne, and on behalf of the Society presented a congratulatory address to the President, The Right Hon. The Viscount Grey of Fallodon, K.G.

The Library has received additions from Drs. R. F. Scharff, A. E. Boycott, W. T. Elliott, J. C. Melvill, and Herman v. Ihering, Messrs. H. Schlesch, Shintaro Hirase, R. J. Welch, A. W. Stelfox, W. B. Marshall, C. T. Simpson, A. S. Kennard, B. B. Woodward, B. Peyer and E. Kuhn, Mrs. Ida Shepard Oldroyd, Miss Tera van Benthem Jutting and Miss Lucy Reardon.

Gifts to the Cabinet have been made by Mr. Hans Schlesch,

RECORDER'S REPORT (Non-Marine).

SINCE the last report (vol. xviii, p. 299) the following 33 records have been authenticated for the Census. *Limnæa glabra* has at last been verified in Ireland.

Cornwall W. (1):—*Hyalinia radiatula* (C. Oldham). *Limnæa auricularia* has been introduced into an artificial lily pool at Perranuthnoe.

Herts (20):—*Paludina contecta* (Harefield; C. Oldham).

Middlesex (21):—*Vertigo pygmæa* (R. Waterston).

Norfolk W. (28):—*Anodonta anatina* (F. J. F. Barrington).

Northampton (32):—*Pisidium obtusale* (C. Oldham).

Worcester (37):—*Limax cinereoniger* (Wyre Forest: J. H. Adams).

Glamorgan (41):—Specimen in National Museum of *Margaritana margaritifera* labelled "Swansea" presumably from Swansea Canal as recorded by J. G. Jeffreys *B.C.* vol. i, p. 38.

Yorks S.E. (61):—*Pisidium hibernicum* (A. Smith).

Yorks N.W. (65):—*Pisidium personatum* (C. Oldham).

Northumberland N. (68):—*Helicella caperata caperata*, *Vallonia excentrica*, *Limnæa palustris*, *Planorbis spirorbis* (E. P. Blackburn).

Aberdeen S. (92):—*Ancylus lacustris*, *Pisidium pulchellum* (C. Oldham).

Main Argyll (98):—*Limnæa palustris* *Sphærium corneum*, *Pisidium casertanum*, *P. hibernicum*, *P. lilljeborgii*, *P. milium*, *P. nitidum*, *P. obtusale*, *P. pulchellum*, *P. subtruncatum* (R. Waterston). *Planorbis corneus* var. *rubra* has been introduced near the curling pond at Bonawe.

Orkney (111):—*Arion subfuscus* (C. Oldham).

Shetland (112):—*Vitrina pellucida*, *Punctum pygmæum*, *Vertigo pygmæa*, *Sphyradium edentulum* (C. Oldham).

Wicklow (126):—*Pisidium lilljeborgii* (Kelly's Lough: C. Oldham).

Wexford (127):—*Limnæa glabra* (Ballymacar: see *Irish Nat. J.* 1929, vol. ii, p. 182: G. Roche).

Kerry N. (148 N.):—*Pisidium casertanum* (J. C. Dacie).

RECORDER'S REPORT (Marine Mollusca).

I regret to record that very few spontaneous reports are made to me by our observers and collectors, and wish to emphasize the importance of all definite records. This year I have received two reports only: Mr. R. Rendall records *Pleurobranchus plumula* Montagu from Birsay, Orkney, which is the most northerly record for this species: Forbes recorded it from Skye and Lovén from Bohuslän. Mr. G. C. Spence sends a sample of the mollusca occurring alive at New Quay, Cardiganshire of which he remarks "I do not think I have ever been on so barren a shore"; the species were *Patina pellucida* (L.) var. *lævis* Pennant, *Patella vulgata* L., *Gibbula umbilicalis* (da Costa), *Osilinus lineatus* (da Costa), *Littorina littorea* (L.) and *Heteranomia squamula* (L.).—R. WINCKWORTH.

REPORT OF THE YORKSHIRE CONCHOLOGICAL SOCIETY.

Yorkshire Branch of the Conchological Society of Great Britain & Ireland.

Eleven meetings were arranged for the Session, four of which were excursions during the summer months. The collecting expeditions have not proved very successful. Excursions were made to Shipley Glen, Methley, York and Boston Spa. The poor results were probably due to the severe drought, and to the frosts which occurred early in the year.

The lectures however have been well attended and of great interest and helpfulness. Special mention should be made of the Presidential Address by Dr. H. C. Versey, entitled 'Form and Habitat,' illustrated by lantern slides.

The Society has suffered a grievous loss through the death of Mr. J. A. Hargreaves of Leeds. He had been a conchologist for very many years and a member of this Society since 1916 and for some years previous to this had been a corresponding member, when he resided in Scarborough. He lectured to the Yorkshire Society on many occasions during his membership and was always ready to help along and advise others in their difficulties.

We also lost the membership of our friend Mr. E. E. Gregory who has removed out of the district and we wish him all success in his new surroundings.

Two other members resigned during the year.

The total membership of the Branch now stands at 43.

JOHN R. DIBB, *Hon. Sec.*

ANNUAL REPORT OF THE LONDON BRANCH.

IN spite of the vicissitudes since the loss of our late Secretary, Mr. J. C. Dacie, I am glad to report that, thanks to its staunch supporters, the branch is once again in full swing with its former vigour. A room has been taken at the Cripplegate Institute and the first of the Winter meetings was held on the 14th October, with a good attendance. A. S. Kennard continued as President, and Guy L. Wilkins was elected Hon. Secretary. It was unanimously agreed that a letter of condolence should be sent to Mrs. Dacie on behalf of members of the Branch, as a mark of their appreciation of Mr. Dacie's many years of practical help in connexion with the work of the Society. Field meetings were held to take the place of June and July meetings, to Denham and Mill Hill, led by J. E. Cooper. At Denham the object was to collect *Vertigo moulinsiana* (Drap.) which was found in abundance in a ditch by the canal. A pond at Mill Hill yielded five species of *Pisidia* and a curious stunted form of *Lymnaea stagnalis* (L.). As far as I can see the Branch will flourish as in former years. Four new members have joined, making a total membership of 22—GUY L. WILKINS, *Hon. Sec.*

ANNUAL REPORT OF THE NORTH STAFFORDSHIRE BRANCH.

I regret there is nothing of interest to report this year. I am of the opinion that the dry season is responsible for the non-appearance of land shells.

Mr. W. Hill, who was made a member of the Society this year, has become attached to the local Branch—B. BRYAN, *Hon. Sec.*

577th Meeting, held at the Manchester Museum, November 6th, 1929.

Mr. G. C. Spence in the chair.

Additions to Library.

"Shells of Peitaiho," by A. W. Grabau and S. G. King (presented by the latter).

Four papers by H. Schlesch (from the author).

Member Deceased.

James Cosmo Melvill.

A vote of condolence was passed unanimously.

New Members Elected.

Miss Anne Byrant. Thomas G. W. Fowler.

Papers Read.

- "Locomotive Habit of *Dreissena polymorpha*," by C. Oldham.
 "Mollusca on Gateholm," by A. E. Ellis.
 "Note on the spelling of *Lymnæa*, Lamarck," by J. Davy Dean.
 "*Clausilia biplicata* and its Habits," by Dr. A. E. Boycott.
 "Note on the Marine Mollusca at Hengistbury Head and Cliff-End near Christchurch, Hants," by E. St. John Burton.

Exhibits.

By Mrs. Gill :—Series of *Helicostyla*.

By Mr. A. K. Lawson :—Large *L. stagnalis* from Rostherne Mere, Cheshire.

By Mr. G. C. Spence :—Shells from Lake Albert Nyanza.

578th Meeting, held at the Manchester Museum, December 4th, 1929.

Mr. G. C. Spence in the chair.

Additions to Library.

Large number of papers by Dr. H. A. Pilsbry and others (presented by Dr. Pilsbry).

Candidate Proposed for Membership.

John Vivian Dacie, 123, Upper Richmond Road, Putney, S.W. 15 (introduced by A. J. Peile and A. S. Kennard).

Resignations.

F. A. Sowter.

W. Ritson.

Papers Read.

- "On the Status of *Penion* Fischer," by W. J. Clench.
 "The genus *Hemistomia* Crosse, in New Caledonia," by Prof. T. D. A. Cockerell.
 "A New Operculate Land Snail from New Caledonia—*Palaina montrouzieri* (Crosse) var. *humilior* n.," by Prof. T. D. A. Cockerell.

Exhibits.

- By Mrs. Gill :—Engraved septa of *Nautilus*.
 By Mr. C. H. Moore :—*Buccinum undatum* (long form) from Shetlands ; *B. grænlandicum* from Iceland.
 By Mr. G. C. Spence :—Copies of Shuttleworth's "Notitiæ Malacologicæ," Heft i, 1856 ; Heft ii (n.d.).
 Special Exhibit, Tanganyika shells.



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THE
JOURNAL OF CONCHOLOGY.

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JULY, 1930.

No. 2.

THE GENUS *ALOPIA* H. and A. Adams, 1855.

BY THE REV. A. H. COOKE, Sc.D.

(Read before the Society, April 5th, 1930).

DR. Soós has published, in the *Annales Musei Nationalis Hungarici*, XXV (1928), pp. 261-426, a valuable memoir of this interesting genus. It is written in Hungarian, followed by a briefer analysis in English. In the text are sketch maps illustrating distribution, and some excellent figures of the reproductive and other organs. There is also the inevitable "Entwickelungs-schema" or suggested scheme of specific development, which does not appear to bear close resemblance to that of M. Kimakovicz (*Prodromus*, p. 23).

Dr. Soós, with other writers, regards the existing species of *Alopi*a as derived from an archaic type inhabiting the upper regions of the limestone E. Carpathians. The principal difficulty in classifying the species of *Alopi*a is, "that part of the forms . . . is sinistral, in opposition to the other (part) which is dextral; and that certain sinistral and dextral forms are alike so far as to agree in every respect, the direction of the whorls excepted, i.e. several forms seem to be amphidromic (indifferently sinistral or dextral)." Soós however holds, and gives good reason for holding, that the sinistral and dextral forms are specifically distinct. In this view, in arriving at which he is assisted by the analogy of *Partula*, he agrees with Ad. Schmidt, Rossmässler, O. Böttger, and M. Kimakovicz, in opposition to the views of E. A. Bielz and A. J. Wagner. Soós' classification, therefore, is based on the sinistral or dextral coil of the whorls, each group being further sub-divided according to the absence or presence of a clausilium.

The following synopsis of the genus as a whole may be useful to students, and is compiled, I hope correctly, from Dr. Soós' "Hungarian" pages.

A. SINISTRAL FORMS.

(a) Clausilium absent.

1. *glauca* Bielz: variety *latens* Pfr.
2. *cyclostoma* Bielz.

3. *lactea* Bielz: varieties *nefaria* Kim., *transitans* Kim., *costata* Bielz, *inornata* Kim., *cæsarea* Kim., *striaticollis* Kim., *mauritii* R. Kim., *costicollis* Kim., *proxima* Kim., *ambigua* Kim., *haueri* Bielz, *laticosta* Bttg., *mirabilis* Kim.

4. *nixa* Kim.

5. *straminicollis* Charp.: varieties *novalis* Kim., *druyvesteijni* Soós.

(b) Clausilium present.

6. *intercedens* Rossm.: varieties *connectens* Soós, *boettgeri* Kim., *monacha* Kim., *subita* Kim.

7. *plumbea* Rossm.: varieties *schmidtii* Kim., *bellicosa* Kim.

8. *regalis* M. Bielz: varieties *adventicia* Kim., *mutabilis* Kim., *valachiensis* Bttg., *mathildæ* Kim., *deubeli* West., *proclivis* Kim., *princeps* Soós.

9. *fussiana* Bielz: varieties *diabolina* Kim., *insignis* Bielz, *elegans* Bielz.

10. *bogatensis* Bielz: variety *angustata* Bielz.

11. *occidentalis* Bttg.: varieties *jickelii* Kim., *microstoma* Kim., *vicina* Kim.

B. DEXTRAL FORMS.

(a) Clausilium absent.

12. *nefasta* Kim.

13. *livida* Menke: varieties *minima* A. Sch., *minor* Bttg., *bipalatalis* Kim., *sororcula* Soós, *maxima* A. Sch.

(b) Clausilium present.

14. *helenæ* R. Kim.

15. *meschendörferi* Bielz: varieties *jekeliana* Soós, *cybæa* Kim., *obesa* Kim., *hypula* Soós.

16. *lischkeana* Charp.: varieties *grandis* Bielz, *violacea* Kim.

17. *bielzi* Pfr.: varieties *madensis* Bielz, *tenuis* Bielz, *clathrata* Rossm.

J. Davy Dean (J. of C. XV, 262-267) attached the name *Ithyption* to both sinistral and dextral species of *Alopiæ* in which the clausilium is absent. This of course involves the assumption (which needs argument to support it) that the presence or absence of a clausilium is of more value in determining sectional distinction than the dextral or sinistral coil of the whorls. One is glad to see that *glauca* Bielz takes its true place as the *Alopiæ* of the N.E. Transylvania Mts. while the needless *binodis* Kim. is dropped. A similar fate befalls Kimakovicz's wild theory that Menke's *livida*, the 'doyen' of the group, found in countless thousands on the Bucsecs and neighbouring heights, visited by all and sundry, was not that shell, but a form occurring many miles away, in

a few localities difficult of access, e.g. Mt. Vulkan, near Abrudbanyah; *fussi* var. *nota* therefore disappears too. It is not quite clear why *elegans* Bielz is regarded as a var. of *fussiana* Bielz, while *intercedens* A. Sch., which Bielz regarded as a var. of his *elegans*, becomes a distinct species. *Canescens* Parr. drops out altogether, perhaps from difficulty of identification. *Valachiensis* Bttg. is still given the locality Kloster Ceia, though R. Kimakovicz, the other day, sought for it there in vain. The shell certainly appears more akin to forms from the Piatra Mare group, than to those from the Bodza Mts.

Altogether, Dr. Soós is to be heartily congratulated on an essay which, if not the last word on *Alopi*a, is certainly the most comprehensive and useful contribution to the knowledge of the group yet published, both as regards synonymy, anatomy and distribution.



New Name for *Crassatella capensis* Odhner.—Dr. Nils Odhner applied this name in 1922 to a new species dredged by the Skoog expedition in 40-fathoms off Cape Infanta, South Africa (Göteborgs K. Vet. Vitt.—Samh. Handlingar xxvi, No. 7, p. 4). This specific name, however, was used by Lamy in 1917 (Journ. de Conch., LXII, p. 237) as a substitute for *Crassatella africana* Sowerby, 1904, *non* *C. africana* Marrat 1878. I mentioned the point recently to Dr. Odhner, and he replied that he had already noted the preoccupation but had no opportunity for the present of renaming the species, and suggested that I should do so. I have great pleasure in associating his name with it and calling it *C. odhneri*.—J. R. LE B. TOMLIN.

THE FOOD OF GEOMALACUS MACULOSUS.

By A. E. BOYCOTT & C. OLDHAM.

A few days at Glengariff, in County Cork, in August, 1929, and the kind help of Miss A. Lorrain Smith and Prof. E. J. Salisbury in identifying the lichens and mosses enabled us to get some definite information as to what *Geomalacus* actually eats in its native haunts. At low levels (e.g. in the fields opposite the R.C. Church) the rocks on which *Geomalacus* lives have an abundant vegetation of mosses (*Rhacomitrium canescens*, *R. heterostichum*, *Hypnum cupressiforme* and *Phycomitrium polyphyllum*) and lichens (*Cladonia furcata*, *C. sylvatica*, *C. cervicornis* and *Parmelia perlata*), the last-named being the leafy, black and white lichen to which *Geomalacus* is supposed to have (and indeed does have) a considerable resemblance. The fæces of specimens taken on these rocks consisted chiefly of parts of the *Parmelia* and fragments of a *Rhacomitrium* together with a few green algæ presumably derived from some of the lichens. But at higher levels (e.g. on the open moor up the Kenmare road) these conspicuous plants are absent from rocks on which *Geomalacus* abounds and we watched the slugs at night feeding on the thin organic film which covers them, the whitish parts of which are composed of the lichen *Pertusaria areolata*, the brown areas of the lichen *Bacidia umbrina*, the latter in one sample being mixed with the alga *Stigonema*. On these almost bare rocks, and especially on the *Pertusaria*, the slugs make conspicuous feeding tracks. The truth probably is that *Geomalacus* has no specific food plant and eats any lichens (and also mosses) which happen to be available. In captivity it readily feeds on cabbage, carrot and on a mixture of oatmeal and powdered chalk, and there seems to be no reason to suppose that its peculiar Lusitanian distribution is determined by the occurrence of any special food. The interesting information given on pp. 395 ff. of Miss Lorrain Smith's book *Lichens* (Cambridge University Press, 1921) suggests that certain mollusca and other animals like to eat lichens in general without having any marked preferences for particular kinds, just as *Limax tenellus* etc. eat most toadstools which they meet with in their appropriate habitats.

OBITUARY NOTICE: MARCHESE DI MONTEROSATO.

By J. R. LE B. TOMLIN, M.A.

OUR distinguished Hon. Member, Monterosato, died on March 1st, 1927. It is only recently, however, that I have been able to assemble the following details as to his biography, thanks to Dr. Francesco Cipolla and Marchese Antonio de Gregorio, of Palermo, who have both published accounts of his life and have very kindly placed them at my disposal.

Tommaso di Maria, Marchese di Monterosato, was born in June, 1841. His father was Casimiro, Barone di Alleri; his mother Carolina Natale, daughter of Tommaso Natale, a well-known lawyer and historian; it was through her that he inherited the title of Marchese di Monterosato, which belonged to his grandfather.

He was educated at a monastery in Palermo, and married first into the Campobianco family, but his wife died very young, and he then married Teresa Ferrara, daughter of Francesco Ferrara, who was famous for the part he took in the 'risorgimento' and after being imprisoned and banished by the Bourbon Government held many important political and administrative posts.

Monterosato is said to have had a passion for malacology from quite an early age, and he received much encouragement therein from such famous Sicilian naturalists as Libassi, Brugnone and Benoit. With his second wife he made constant journeys both in Italy and abroad in order to gain the personal acquaintance of contemporary conchologists and to study their collections.

In this way he met Weinkauff, Kobelt, Locard, Issel, Tiberi, Doderlein, Paulucci, Aradas, Brusina, Mörch, Bourguignat, Crosse, Lartet, Petit de la Saussaye, Seguenza, Dautzenberg, P. Fischer, Hanley, McAndrew, Battersby, Deshayes and Jeffreys. It was to Jeffreys that he used to say he owed most, and he stayed with him at Ware to study the Weinkauff and other collections that Jeffreys had acquired. Similarly, he familiarised himself with those of Aradas and Maravigna at Catania, of O. G. Costa and De Stefanis at Naples, that of Risso at Nice, that of Nardo at Venice, that of Payraudeau in the Jardin des Plantes at Paris, Philippi's recent and fossil shells from Sicily at Berlin—as described in his "*Enumeratio Molluscorum Siciliae*," the de Burgh and McAndrew collections in London, as well as, of course, the national collections in the various countries that he visited.

Almost from the first he devoted himself to the study of the mollusca of the Mediterranean, restricting his collection to that area and to the mollusca of the adjacent seas as far as they were necessary

to elucidate his Mediterranean studies, and it was not long before he turned his attention to the postpliocene deposits at Ficarazzi and Monte Pellegrino, which were within such easy reach, to aid his comparative work.

In a little while he extended his researches to the terrestrial mollusca—first those of Sicily, and gradually on to the Italian and European Land and Freshwater Shells, and amassed an enormous amount of material in all branches by his own collecting, by exchange and by the purchase of several collections, the most important being that of the Abbé Brugnone, which included those of Calcara and of two or three other Sicilian conchologists. When Brugnone died Monterosato and his wife went over to Caltanissetta, acquired the collection and there and then packed it and brought it back to Palermo. Monterosato's collections were sold *en bloc* before his death to Comm. Vito Beltrani of Palermo.

He was an extraordinarily accurate and careful observer, and it was very, very seldom that one could challenge his decision in the discrimination of a species; the smaller the shell, the more exact and reliable was his comprehension of it. Some years before the war I had the privilege of seeing a good deal of him at home amid his collections and of discussing with him many interesting points relating to Mediterranean mollusca, and I can only say that I came away with a very greatly enhanced appreciation of his memory, his knowledge and his acumen.

As he got older he gradually developed a most exaggerated idea as to the limitations of genera and species; the doctrines of the Bourguignat school seem to have captured Monterosato and he went to extreme lengths of segregation both in some of his favourite marine groups and in the Helicidæ. I have heard him assert that there were at least 100 species of *Cerithium* in the Mediterranean and the number of small Trochidæ increased with every paper; in that on the land-shells of the islands adjoining Sicily he created no less than 40 new sections of *Xerophila*—Pilsbry's trenchant comments thereon will be found in the "Manual" (2), ix, 247. He also carried this minute subdivision a step further by the addition of numbers of varietal names derived from form and colour. As often as not these were undefined, and it is a very nice point for the exercise of dialectics whether (e.g.) "var. ex colore *rubra*" or "var. ex forma *tumida*" can be rescued from the category of *nomina nuda*!

Probably to the recent conchologist his most important papers are the three annotated catalogues of Mediterranean marine shells, viz.—

Nuova Rivista, 1875.

Enumerazione e Sinonimia, 1878-9.

Nomenclatura Generica e Specifica, 1884.

As far as I can ascertain, the following is a complete list of his molluscan papers, in chronological order, the titles being epitomised :—

1869. A New Medit. *Dolium*, Journ. de Conch., xvii, 228.
 Three New Species. *ibid*, p. 274.
 Testacei Nuovi dei Mari di Sicilia.
1870. *Dacrydium* in the Medit., Bull. Malac. Ital. iii, p. 43.
1872. Notizie Conch. Medit.
 Notizie Conch. Foss. Monte Pellegrino e Ficarazzi.
1873. Notizie Solarii Medit.
 Remarks on Mollusca in O. G. Costa's 'Microdoride Medit.,'
 Ann. Mag. N. Hist. (4), xii, 251.
1874. Recherches Conchyl. au Cap S. Vito, Journ. de Conch., xxii,
 243, 359.
1875. Poche Note Conch. Medit.
 Note Critiche articoli Weinkauff e Kobelt, Bull. Soc. Mal. Ital.
 i, p. 68.
 Nuova Rivista, Atti. Ac. Sci. Lett. Palermo, n.s., v, p. 1.
1877. Notizie Conch. Civitavecchia, Ann. Mus. Civ. Genova, ix, 407.
 Cat. Conch. Foss. M. Pellegrino e Ficarazzi, Boll. Comit.
 Geol. Ital., viii, p. 28.
- 1877-8 Coquilles des Côtes d'Algérie, Journ. de Conch., xxv, p. 24,
 xxvi, p. 313.
1878. Coquilles draguées dans les eaux de Palerme, *op. cit.* xxvi, 143.
 Enumerazione e Sinonimia, Giorn. Sci. Nat. Econ. Palermo, xiii,
 p. 61.
1879. Id. pt. 2 (Chitonidi), *op. cit.* xiv, 9.
 Nota sull' articolo Conch. Pompeiane di Tiberi, Bull. Soc.
 Mal. Ital. v, 201.
 Conch. delle Coste d'Africa, *op. cit.*, p. 213.
1880. Conch. Zona degli Abissi, *op. cit.* vi, 50.
 Note Conch. Coralligene, *op. cit.*, p. 243.
- 1881-2 Conch. del Medit., Nat. Sicil. i, 2, 49, 97.
- 1883-5 Conch. Litt. Medit., *op. cit.* iii, 87, 102, 137, 159, 227, 277 ;
 iv, 21, 60, 80, 200.
1884. Nomenclatura Gen. e Specifica.
1888. The Adami Collection, Nat. Sicil. viii, 55.
- 1888-9 Moll. Porto Palermo, Bull. Soc. Mal. Ital. xiii, 161 ; xiv, 75.
1889. The Medit. Donax, Nat. Sicil., viii, p. 95.
 Coquilles Marines Marocaines Journ. de Conch., xxxvii, pp.
 20, 112.
1890. Conch. Profondita Mare Palermo, Nat. Sicil. ix, 140, 157,

1891. Moll. Quatern. S. Flavia, op. cit. x, 96, 120.
Relationship of Quaternary to Recent Moll., Boll. Soc. Sci. Nat. Econ. Palermo, 1891.
1892. European *Pectunculus*, Nat. Sicil., xi, 143.
Medit. Vermetidæ, Bull. Soc. Mal. Ital., xvii. 7.
Emarginula compressa Cantraine, Journ. de Conch., xl, 78.
1893. Moll. Terr. Isole Adiacenti Sicilia, Atti Ac. Sci. Lett. Palermo (3), ii, 3.
1894. Conch. Terr. Viv. e Foss. M. Pellegrino, Nat. Sicil., xiii, 165.
Hagenmulleria Bgt., Journ. de Conch., xlii, 112.
1895. *Barleeia* Clark, op. cit., xliii, 77.
1896. Najadi Sicil., Nat. Sicil., n.s., i, p. 6.
1897. Medit. *Cypræa*, Journ. de Conch., xlv, 153.
1899. Some European Pectens, op. cit., xlvii, 182.
Marine Moll. of Cyprus, ibid., p. 392.
1901. A New *Xerophila*, Nachrichsbl., xxxiii, 186.
1905. *Dentalium politum* O. G. Costa, Ann. Mus. Napoli, i, No. 27, p. 1.
1906. Auriculidæ, Assiminidæ and Truncatellidæ of Europe, Nat. Sicil., xviii, 125.
Pecten opercularis L., ibid., p. 145.
1908. *Eulima ptilocrinicola* Bch., Journ. de Conch., lvi, 116.
1909. *Erycina cuenoti* Lamy, ibid., p. 253.
1910. Cerithiidæ, Giorn. Sci. Nat. Econ. Palermo, xxviii, 65.
1912. Forms of *Nassa reticulata* L., Journ. de Conch., lix, 285.
History of *Nassa tinei*, ibid., p. 294.
1913. *Pseudomalaxis* Fischer, Pr. Mal. Soc. London, x, 362.
1914. *Danilia* Brusina, Journ. de Conch., lxi, 381.
Medit. *Argonauta*, ibid. p. 385.
1915. Medit. *Ostrea* and *Anomia*, Ann. Mus. Civ. Genova, xlvii, 7.
1916. Note on *Arca noæ* L., Nat. Sicil., xxiii, 61.
1917. Living and Quaternary Moll. of the Tripolitanian Coast, Boll. Soc. Zool. Ital. (3), iv, 1.
1923. Moll. of the Coast of Cyrenaica, R. Comit. Talassogr. Ital., mem. 107, p. 1.

The following Brachiopod paper may be recorded:—

1879. Note on *Platidia* O. G. Costa, Journ. de Conch., xxvii, 306.



OBITUARY NOTICE: DR. J. COSMO MELVILL.

By J. WILFRID JACKSON, D.Sc., F.G.S.

(Read before the Society, February 5th, 1930).

JAMES COSMO MELVILL, D.Sc., of Meole Brace Hall, Shrewsbury, who died on Nov. 4th, was born in London on July 1st, 1845. He was a well-known conchological and botanical authority and was the son of Mr. James Cosmo Melvill, Under Secretary of State for India, and grandson of Sir James Cosmo Melvill, K.C.B., F.R.S., chief secretary of the East India Company. He received his early education at Harrow and later went to Trinity College, Cambridge. On leaving the University, he entered the business of his uncle, Mr. Edward Hardcastle, for a time M.P. for South Salford, and travelled in America and Canada where he had opportunities for studying natural history and of making collections. He later joined the firm of Messrs. G. & R. Dewhurst, Ltd., of Manchester and Preston, serving as a director for many years.

Melvill's knowledge of the mollusca was masterly, and, from his remarkable powers in the discrimination of specific characters, his opinion on any shell submitted to him was valued very highly. In the course of his long lifetime, he came in contact with many celebrated conchologists, such as Lovell Reeve, Hugh Cuming, Lombe-Taylor, Angas, Barclay, E. A. Smith, to mention only a few. His conchological works are remarkable for their quality as well as for their quantity. He published his writings in many English Journals. By means of these publications, written partly in collaboration with others, including Robert Standen, A. Abercrombie, J. H. Ponsonby, and E. R. Sykes, he made known more than one thousand new species.

Melvill began to collect shells at the early age of eight, and during his lifetime this collection grew to be the largest known in private hands, comprising 22,500 species. It passed into the hands of J. R. le B. Tomlin in 1919.

Melvill joined the Conchological Society in 1880 and was President in 1889 and again in 1895-96, on each occasion delivering an excellent address. He became an active member of the Manchester Branch of the Society in 1889, and on several occasions invited members to meetings at his residence at Prestwich, Manchester, when he threw open his magnificent collections for their delectation.

He was an original member of the Malacological Society (founded in 1893) and was its president at the time of his death.

As far as one can gather, Melvill's first conchological contribution was in 1881, when he described the mollusca of South Carolina and Florida obtained by himself (principally at the Island of Key West) in 1871-72. During these years he travelled in North America and also visited the the Island of Cuba.

In the years which followed his first paper, Melvill devoted much time to the study of many special groups of species, as well as to large collections sent to him for description from many parts of the world. Space does not permit of a reference being made to all these works, and only some of the more important can be considered.

Among the monographs upon particular groups one of the most important was a survey of the genus *Cypræa*, or the Cowry shells. This appeared in 1888 and comprised a catalogue of all the then known species and varieties of this attractive group, together with remarks upon nomenclature, geographical distribution, and distinctive affinities. Two new species and several new varieties were described from specimens in his own collection. In the preparation of this memoir, Melvill collected material over a period of eighteen years, and visited important museums in this country as well as at Paris, Brussels, Geneva, and other continental places; also in the United States and Canada. Dr. Melvill was especially interested in the Cowries, of which he possessed a remarkable series, including rarities such as *Cypræa guttata* of which he had one of the finest examples known.

Another rather showy group of marine shells in Melvill's collection was that of the Cones. He possessed nearly four hundred of the five hundred known species, including at least thirty original types and a particularly fine example of the rare *Conus gloria-maris*—the "Glory of the Sea," of which he was especially proud. In 1886, Melvill contributed some notes on the subgenus *Cylinder* of *Conus*, which includes the above mentioned species. In this paper he gave particulars of the whereabouts of the other eleven examples of this very beautiful species, now thought to be extinct in its original habitat, the Isle of Bohol, Philippines.

In 1891, he made a careful study of the genus *Latirus*, based upon material in his own collection and in the British Museum (Natural History). Of this group of marine shells he had in his possession over two-thirds of the known species, and in this paper, in addition to describing eleven new species, he dealt with the early history, classification, general characteristics, and geographical distribution. He also commented on the display of prismatic colours in certain species when the epidermis is wetted or oiled. Having noticed, in deep tidal pools round our coasts and in other countries, that certain marine

algæ appear prismatic in the water and lose this iridescence immediately on being withdrawn from their native element, he suggested that the *Latirus* with iridescent epidermis may feed exclusively on algæ possessing this peculiarity and so a colour resemblance has been given them for protective purposes. Twenty years later, in a further paper on this same genus, he described three new species.

In all his work, Melvill tried to commemorate the assistance he had received, and named species after species after the members of his own family circle or his numerous friends who in one way or another had helped him with the gift or loan of specimens or in the sorting of the vast collections he received from time to time.

During 1895-97, Melvill, together with Robert Standen, published reports upon an interesting collection of shells from Lifu and Uvea, Loyalty Islands, obtained by the Rev. James and Mrs. Hadfield, of Lifu, in 1891-93. The Loyalty Islands form part of the New Caledonian Archipelago and are situate east of the main Isle. Active researches have been carried on in that region by many noted French conchologists, but no catalogue of the whole Marine Molluscan fauna of the Loyalty Islands group had hitherto been published. The Hadfield collection provided an opportunity for this to be done and over 860 species were reviewed in the course of the study. About 106 of these were considered to be new to science. Commenting on the Lifu collection, Melvill drew especial attention to the fact that many of the shells had a very wide range, some occurring at Mauritius, although separated by nearly 3,000 miles in distance.

In 1898, Melvill, along with R. Standen, published a list of nearly four hundred species of marine shells, including seven new to science, obtained during dredging expeditions in the neighbourhood of Madras by Professor J. R. Henderson, of the Christian College, Madras.

Again in 1899, with the same helper, he reported on the marine mollusca obtained during the First Expedition of Professor A. C. Haddon to the Torres Straits, in 1888-89. Twenty-four species new to science and one new genus were described on this occasion.

From 1897 to 1899 and again in 1903, the marine mollusca of the Andaman Islands received some attention, and from this region, Dr. Melvill, in collaboration with E. R. Sykes (his son-in-law) described twelve new species out of a total of 381 forms.

The shells of the Antarctic region claimed his attention on several occasions. In 1898 and again in 1901 he described shells from the East Falklands collected by Miss Cobb and Mr. Rupert Vallentin. A further consignment from the North-West Falklands, sent by Mr. Vallentin, was dealt with in 1914. This was the first group of shells

to be brought from this locality and they were, therefore, of greater interest than usual. Six new species were described and interesting details given as to geography and climatic conditions. The largest collection from this region was described in 1907 and 1912 when Melvill and Standen dealt with the marine mollusca of the Scottish National Antarctic Expedition obtained by S.Y. "Scotia."

These were especially interesting on account of certain forms having been for the first time brought to light from unusual depths, and as showing a greatly extended range for certain species already known. Some of the shells had been dredged from 1,410, 1,775, 2,000, 2,500 and 2,645 fathoms, the first being over one and a half miles deep, and the last, three miles deep. The total number of species examined was 152, including over 20 new to science.

The mollusca of the Arctic region also came in for some study in 1900 when Melvill and Standen reported upon the results of the "Jackson-Harmsworth" Expedition to Franz-Josef Land (1896-97), and the "Andrew Coats" Cruise (1898) to Kolguev, etc. The material of these two expeditions was due to Dr. W. S. Bruce. The shells from the first-named expedition were specially interesting by having been found at a more northerly latitude than any previously reported. A new species of whelk was named after Dr. Bruce.

In 1909, Melvill reported upon a collection of marine shells obtained by Mr. J. Stanley Gardiner, among the islands of the Indian Ocean, in 1905, during the cruise of H.M.S. "Sealark" in the neighbourhood of Mauritius and the Seychelles. Four hundred and seventy-five species were dealt with, of which fifteen were new to science. From his extensive knowledge of the others, Melvill was able to give their range in the Indo-Pacific Region. An astonishingly large number ranged as far as the Philippine Isles.

Perhaps the largest piece of research work carried out by Dr. Melvill was the description of the marine shells of the Persian Gulf, Gulf of Oman and the North Arabian Sea. In much of this work he was assisted by Robert Standen. Others, including myself, helped in the task of sorting the vast amount of material preparatory to the identification of the various forms by Melvill. The study of the shells of this region by Melvill really began about 1893, when, along with Alexander Abercrombie, he named and described a collection formed by the latter at Bombay. This comprised about 350 species, of which 52 were new to science. The main collections from this very rich region were obtained by Captain F. W. Townsend (mostly during the years 1893-1915) while officially connected with the Submarine Telegraph Service in the North Indian Ocean. Many of the shells were minute and obscure and the work entailed in their discrimination was

enormous. The sum total of species dealt with from this region amounts to between eighteen and nineteen hundred, and the new species described total six hundred and ten. Melvill's last report on the Persian Gulf mollusca was in November, 1928.

While engaged in the study of the shells of the Persian Gulf and immediate neighbourhood, Melvill paid some attention to the molluscan fauna of the Red Sea, and from 1898 to 1901 described some twenty-three new species from collections made by Commander E. R. Shopland, R.I.M.

Melvill did not restrict himself entirely to marine shells, but, in collaboration with J. H. Ponsonby, published in 1896 the descriptions of seven new species of terrestrial and fluviatile mollusca from the Hadramaut, South Arabia. These were collected by Mr. and Mrs. J. Theodore Bent in a desert region near Dhofar, some 800 miles east of Aden. In addition, and again with the help of Ponsonby, Melvill in 1898 published a Check List of Non-Marine Mollusca of South Africa, and during the years 1890 to 1909 described 237 new species of land and freshwater shells from that part of the world. In 1907, with R. Standen, he published notes on some land and freshwater shells obtained in North-Eastern Rhodesia, during 1905, by Mr. Sheffield A. Neave. Three new species were described from this collection.

In concluding this somewhat inadequate notice of the conchological career of the late Dr. J. Cosmo Melvill, I cannot but feel that his departure from our midst is a very sad loss to science.

His remarkable knowledge of the geographical distribution of the shells of the world was ever at the disposal of others pursuing the same study. His knowledge of Greek and Latin was excellent and is well shown in the description and naming of the many new species he created.

It only remains for me to add that on the occasion of the Victoria University conferring upon him the degree of Doctor of Science, Professor Lamb remarked :

“It is chronicled of Solomon that he spake of trees, from the cedar that is of Lebanon, unto the hyssop that springeth out of the wall, but it is not recorded that he also knew by heart all the shells from the Arctic Circle to the Persian Gulf. That double weight of learning was reserved for the accomplished systematist, Mr. Cosmo Melvill, and those who know him will testify with what gracious modesty he sustains it.”

LIST OF THE LATE DR. J. C. MELVILL'S MOLLUSCAN PAPERS.

BY J. R. LE B. TOMLIN, M.A.

Journal of Conchology.

- III. 155, 1881. List of Mollusca obtained in S. Carolina and Florida, principally at the island of Key West in 1871-2.
- IV, 43, 1883. Description of a New *Cassis*.
- IV, 316, 1885. Description of a New *Bullia* and a New *Scalaria*.
- V, 279, 1888. Descriptions of six New Pectens.
- V, 281, 1888. Descriptions of fifteen New Mitras.
- V, 288, 1888. Description of a New *Cypræa*.
- V, 316, 1888. *H. lapicida* v. *albina* in Derbyshire.
- V, 332, 1888. Notes on *Mitra rugosa* Sw.
- V, 348, 1888. Two New Siphonalia from Japan.
- VI, 31, 1889. Descriptions of a New *Coralliophila*, a New *Eulima* and a New *Zizyphinus*.
- VI, 190, 1890. British Pioneers in Recent Conchological Science.
- VI, 404, 1891. *Calliostoma* (vel *Zizyphinus*) *haliarchus*.
- VI, 405, 1891. Description of Eleven New Species, belonging to *Columbarium*, *Pisania*, *Minolia*, *Liotia* and *Solarium*.
- VII, 120, 1892. Notes on *Cypræa chrysalis* Kiener and *C. amphithales* Melvill.
- VII, 194, 1893. *Cypræa cruenta* var. *coloba* Melvill.
- VIII, 59, 1895. Life of Hugh Cuming.
- VIII, 84, 273, 379, 396, 1895-97 (with R. Standen). Shells of Lifu.
- VIII, 435, 1897. The principles of Nomenclature.
- IX, 30, 75, 1898 (with R. Standen). Marine Mollusca of Madras.
- IX, 85, 1898. Note on *Cypræa rashleighana* Melvill.
- IX, 97, 1898 (with R. Standen). Marine Shells from the Falklands.
- IX, 115, 1898. *Latirus armatus* Ad.
- IX, 152, 1899. *Mitra rhodochroa* Hervier and *M. rhodinosphæra* Melvill.
- IX, 172, 1899. Corrosion of Shells.
- IX, 181, 1899. *Scalaria fimbriolata* Melvill.
- IX, 185, 221, 1899 (with R. Standen). *Herviera*, a new genus of Pyramidellidæ.
- IX, 233, 1899 (with R. Standen). The *caput-serpentis* group of *Cypræa*.

- IX, 303, 1900. Revision of the Textile Cones with a description of *C. cholmondeleyi*.
- IX, 319, 1900. Obituary of Sir R. W. Rawson.
- IX, 344, 1900. Life of Lovell Reeve.
- X, 9, 1901 (with Messrs. Chaster, Hoyle and Knight). List of of Brit. Marine Moll. and Brachiopoda.
- X, 43, 1901 (with R. Standen). Mollusca in the Falklands.
- X, 117, 1901. *Cypræa chrysalis* Kiener and *C. microdon* Gray.
- X, 142, 1902. Obituary of T. Rogers.
- X, 320, 1903. The Genera *Pseudoliva* and *Macron*.
- X, 340, 1903 (with R. Standen). The genus *Scala* in the Persian Gulf, Gulf of Oman, and N. Arabian Sea.
- XI, 117, 1904 (with R. Standen). Cypræidæ of the Persian Gulf, etc.
- XI, 161, 1905 (with R. Standen). *Rostellaria delicatula* Nevill.
- XI, 176, 1905. The Subgenus *Casmaria* of *Cassis*.
- XI, 192, 1905. Four colour varieties of *Cypræa*.
- XI, 225, 1905. Obituary of F. P. Marrat.
- XI, 362, 1906 (with R. Standen). Note on *Odostomia lutea* Garrett.
- XII, 139, 1908. Obituary of S. I. DaCosta.
- XII, 258, 1909. Obituary of R. D. Darbshire.
- XII, 295, 1909. *H. cantiana* in Shropshire.
- XII, 296, 1909. *Trivia cotispunctata* Gaskoin.
- XIII, 164, 1911. Additions to the genus *Latirus* since 1891.
- XIV, 281, 1915. Obituary of A. J. Jukes-Browne.
- XIV, 323, 1915 (with R. Standen). New var. of *Cypræa variolaria* Lam.
- XV, 25, 33, 1916. Notes on *Harpa*
- XV, 90, 1916 (with R. Standen). *Trichotropis antarctica* M. & S. non Thiele.
- XV, 120, 1916 (with R. Standen). New Antarctic *Onoba*.
- XV, 150, 1917. Obituary of E. A. Smith.
- XV, 178, 1917. *Conus traversianus* Smith.
- XV, 188, 1917. *Terebra trismacaria* n.sp.
- XV, 195, 1917. Obituary of J. H. Ponsonby-Fane.
- XV, 204, 1917 (with R. Standen). Revision of the *Terebra* of the Persian Gulf, etc.
- XV, 222, 1917. *Conus melvilli* Sow.
- XV, 234, 1918 (with R. Standen). *Photinula wacei* n.sp.
- XV, 261, 1918. *Otina otis* Turton in Scilly.
- XVI, 40, 1919. Obituary of Rev. A. M. Norman.
- XVI, 76, 1920. *Cypræa bernardinæ* Preston.

- XVI, 86, 1920. Correction to Norman Obituary.
 XVII, 141, 1924. Obituary of Lt.-Col. Godwin-Austen.
 XVIII, 35, 1926. Obituary of A. Abercrombie.
 XVIII, 71, 1927. List of Papers by Dr. Hoyle.

Proceedings of the Malacological Society of London.

- I, 51, 1894. *Engina zatricium* n.sp.
 I, 162, 1894. *Engina epidromidea* n.sp.
 I, 221, 1895. New Species of *Pleurotoma*, *Mitra* and *Latirus*.
 I, 224, 1895. Two New Species from the Hadramaut.
 I, 226, 1895. Four New Species of *Engina* and a New *Defrancia*.
 II, 1, 1896 (with J. H. Ponsonby). Seven New Species from the Hadramaut.
 II, 108, 1896. New Marine Shells from Bombay.
 II, 164, 1897 (with E. R. Sykes). Marine Shells from the Andamans.
 II, 291, 1897 (with J. H. Ponsonby). *Achatina studleyi* n.sp.
 II, 292, 1897. *Plecotrema sykesii* n.sp.
 III, 35, 1898 (with E. R. Sykes). Marine Shells from the Andamans.
 III, 166, 1898 (with J. H. Ponsonby). Check-List of Non-Marine Moll. from S. Africa.
 III, 220, 1899 (with E. R. Sykes). Marine Shells from the Andamans.
 IV, 116, 1900. *Bulimulus dukinfieldi* n.sp.
 V, 410, 1903 (with E. R. Sykes). *Marginella lateritia* n.sp.
 VI, 51, 1904. Twenty-three New Species from the Persian Gulf.
 VI, 61, 1904. *Berthais*, a New Genus from the Gulf of Oman.
 VI, 64, 1904. *Oliva gibbosa* Born.
 VI, 158, 1904. Twenty-eight New Species from the Persian Gulf.
 VI, 170, 1904. *Conus coromandelicus* Smith.
 VII, 20, 1906. *Cyclostrematidæ* and *Liotiidæ* of the Persian Gulf.
 VII, 29, 1906. *Cyclostrema prestoni* n.sp. and *Nassa tindalli* n.sp. from Ceylon.
 VII, 69, 1906. Descriptions of Thirty-one Gastropoda and one Scaphopod from the Persian Gulf.
 VII, 81, 1906. *Capulus lissus* Smith as type of a new Subgenus *Malluvium*.
 VII, 217, 1907. *Latirus sowerbyi* n.sp.
 IX, 7, 1910. Identity of *Calliostoma sowerbyi* Pils. with *C. haliarchus* Melvill.
 IX, 147, 1910. *Latirus ernesti* n.sp.

- IX, 171, 1910. Revision of the Pyramidellidæ of the Persian Gulf, etc.
- X, 27, 1912. *Sistrum oparens* n.sp.
- X, 240, 1912. Thirty-three new Gastropoda from the Persian Gulf, etc.
- X, 317, 1913. Identity of *Torinia densegranosa* Pils. and *T. enoshimensis* Melvill.
- XII, 140, 1917. Revision of the Turridæ of the Persian Gulf, etc.
- XIII, 68, 1919. *Bathytoma regnans* n.sp.
- XIII, 69, 1919. *Morum præclarum* n.sp. with remarks on the Genus.
- XIII, 145, 1919. Addendum to Remarks on *Morum* Bolten.
- XV, 162, 1923. Twenty-one New Turridæ.
- XV, 309, 1923. *Turris (Surcula) macella* nom. nov.
- XVI, 138, 1924 (with Lt.-Col. Peile). *Cereobullia* n.gen.
- XVI, 215, 1925. Nine New Species of Mitridæ.
- XVII, 149, 1927. Eight New Species of Turridæ and a New *Mitra*.
- XVIII, 93, 1928. Marine Moll. of the Persian Gulf, Addenda, etc.

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- XLVI, pt. 1, No. 5, p. 119, 1907 (with R. Standen). Marine Moll. of the Scottish Nat. Antarctic Expn., pt. i.
- XLVIII, pt. 2, No. 18, p. 333, 1912 (with R. Standen). Id., pt. ii.

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- 1906, p. 783, 1907 (with R. Standen). Id., pt. ii.

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- XXVII, p. 150, 1899 (with R. Standen). Marine Moll. of Haddon's First Expn. to Torres Straits.

Transactions of the Linnean Society of London.

- Ser. 2, vol. XIII, pt. i, p. 65, 1909. Marine Moll. obtained by Stanley Gardiner among the Islands of the Indian Ocean.

British Association.

- Manchester Meeting in 1887, Handbook pp. 78-87, Mollusca.

Conchologist.

- II, 140, 1893. *Mitra idæ* n.sp.

Journal of Malacology.

- VII, 67, 1899. *Mitra baldwinii* n.sp.
- X, 27, 1903. *Columbellidæ* of the Persian Gulf.

XI, 79, 1904. Twelve New Species and One Variety of Marine Gastropoda from the Persian Gulf.

XI, 86, 1904. *Mitra stephanucha* Melv. with a New Variety.

Memoirs of the Manchester Literary and Philosophical Society.

Ser. 3, X, 76, 1887. Notes on the Subgenus *Cylinder* of *Conus* (this was issued separately in 1886, not in 1885 as stated in the Z. Rec., XXIV., Moll. p. 18).

„ 4, I, 184, 1888. Survey of the Genus *Cypræa*.

„ 4, IV, 365, 1891. Historical Account of the Genus *Latirus*.

„ 4, V, 92, 1892. *Latirus præstantior* n.sp.

„ 4, VII, 17, 1893 (with A. Abercrombie). The Marine Moll. of Bombay.

„ 4, VII, 52, 1893. Twenty-five New Species of Marine Shells from Bombay.

Proceedings of the Manchester Literary and Philosophical Society.

XXIV, 49, 1885. Proposed Revision of the Subgenus *Cylinder* of *Conus*.

Memoirs and Proceedings, Manchester Literary and Philosophical Society.

XLI, pt. 3, No. 7, p. 1, 1897. Thirty-four New Species of Marine Moll. from the Persian Gulf.

XLII, pt. 2, No. 4, p. 1, 1898. Further Investigations into the Moll. Fauna of the Persian Gulf with Descriptions of 40 Species.

Addendum on p. 37.: Description of a New *Strombus*.

XLIV, pt. 1, No. 4, p. 1, 1900 (with R. Standen). Report on the Moll. of the Jackson-Harmsworth Expedition to Franz Josef Land, and of the Andrew Coats Cruise to Kolguev.

LI, pt. 2, No. 4, p. 1, 1907 (with R. Standen). Notes on a Collection made in N.E. Rhodesia by Mr. S. A. Neave.

Addendum: *Achatina morrelli* Pr. var. *kafuensis* nov.

Annals and Magazine of Natural History.

A series of 21 papers, in collaboration with J. H. Ponsonby, on Land and Freshwater Moll. from South Africa appeared as follows.

	<i>ser.</i>	<i>vol.</i>	<i>page</i>		<i>ser.</i>	<i>vol.</i>	<i>page</i>
No. i	(6)	VI,	466, Dec. 1890	No. xi	(6)	XVIII	314, Oct. 1896
,, ii	(6)	VIII,	237, Sep. 1891	,, xii	(6)	XIX,	633, June 1897
,, iii	(6)	IX,	84, Jan. 1892	,, xiii	(7)	I,	24, Jan. 1898
,, iv	(6)	IX,	87, Jan. 1892	,, xiv	(7)	II,	125, Aug. 1898
,, v	(6)	X,	237, Sep. 1892	,, xv	(7)	IV,	192, Sep. 1899
,, vi	(6)	XI,	19, Jan. 1893	,, xvi	(7)	VIII,	315, Oct. 1901
,, vii	(6)	XII,	103, Aug. 1893	,, xvii	(7)	XII,	595, Dec. 1903
,, viii	(6)	XIV,	90, Aug. 1894	,, xviii	(7)	XIX,	94, Jan. 1907
,, ix	(6)	XV,	163, Feb. 1895	,, xix	(8)	I,	70, Jan. 1908
,, x	(6)	XVI,	478, Dec. 1895	,, xx	(8)	I,	129, Feb. 1908
			No. xxi	(8)	IV,	485, Dec. 1909.	

- Ser. 7, I, 194, 1898. Brief Bibliographical Résumé of the Erythræan Moll. with Descriptions of sixteen New Species from Aden.
- ,, 7, IV, 81, 1899. Moll. of the Persian Gulf with Descriptions of Twenty-seven Species.
- ,, 7, IV, 461, 1899 (with R. Standen). *Conus clytospira* n.sp.
- ,, 7, VI, 207, 1900. Two New Trivias.
- ,, 7, VII, 550, 1901. Further Remarks on the Erythræan Moll. with Descriptions of Seven New Species from Aden.
- ,, 7, XII, 289, 1903 (with R. Standen). Sixty-eight New Gastropoda from the Persian Gulf.
- ,, 8, VI, 1, 1910. Twenty-nine New Species from the Persian Gulf.
- ,, 8, XIII, 110, 1914 (with R. Standen). Moll. from the Falklands.
- ,, 9, I, 137, 1918. Thirty-four New Species from the Persian Gulf.



EDITORIAL NOTES.

Dr. Hermann von Ihering died on 24th February last in his 80th year. He was a native of Kiel and studied medicine at Berlin, but was more particularly devoted to Zoology and Geology. In 1880 he emigrated to Brazil and in 1886 purchased an island at the mouth of the R. Camaquã in order to live there and study the fauna. The suppression of slavery in 1887 and the institution of the Republic caused disturbances which very nearly cost him his life, but eventually he was appointed director of the São Paulo Museum and held this post until, in the course of the Great War, Brazil declared war on Germany. He then returned to Europe and settled at Büdingen, where he died early this year. A useful list of his malacological writings will be found in the *Journal de Conchyliologie* LXXIV, p. 82.

In the *K. Norsk. Vidensk. Selsk. Forh.* I, No. 57, pp. 169-172, 1929, Carl Dons records *Xylophaga præstans* Smith from various localities in the Throndhjem Fjord and gives some particularly interesting and beautiful photographs. This appears to be the first notice of its occurrence outside Great Britain.

Dr. Boycott publishes, in the *Trans. Herts. Nat. Hist. Soc.* vol. XIX, pt. i, May 1930, a Re-Survey of the Fresh Water Mollusca of the Parish of Aldenham. The original Survey was published in the same serial in vol. XVII, 1919, and the present paper discusses what has happened in the ten succeeding years, and the effect of the drought of 1921.

It is very interesting to note that in some specimens of *Anodonta cygnea* collected last year near Doncaster Mrs. Morehouse found a number of examples of *Unionicola ypsilophora*. This creature is a mite which lives as a commensal or parasite with freshwater bivalves, occurring in the folds of the mantle. It has only occurred at Kirton-in-Lindsey, Potter Higham and one or two other localities in this country. Mrs. Morehouse's discovery is the most northerly record in England and the first for Yorkshire.

On a card recently issued in furtherance of the anti-litter campaign :-
LITTER.

This is your Country—beautify it.

Resemble not the slimy snails
 Who with their filth record their trails.
 Let it be said where you have been
 You leave the face of Nature clean.

Mr. Oldham has a note in the *Naturalist* 1930, p. 177, on the fecundity of *Planorbis corneus*, and his experience in breeding this species is entirely contrary to Jeffreys' statement in *Brit. Conch.* I, p. 94—"it lays only 2 or 3 capsules, each containing from 20 to 40 eggs."

In one case 63 capsules averaging 27.8 ova apiece were laid. He established the fact that the mortality, both in captivity and in the field, is very heavy.



MACROCHLAMYS MONTICOLA (Benson).

By ALLAN F. ARCHER.

GODWIN-AUSTEN, in 1882,¹ cited Benson's description of *Austenia monticola*, but questions the generic position of the species, due to lack of material for dissection. In 1908, Blanford and Godwin-Austen² placed this species under *Euaustenia* Cockerell. The latter genus³ is ill-defined, being proposed without any description. In the *Fauna of British India*⁴ a short description of the anatomy is given, which is probably based on a dissection of *Euaustenia cassida* Hutton. The justification for the existence of *Euaustenia* is a question yet to be investigated. The radulæ of *E. cassida* are not very distinct from those of *Austenia planospira* Bens.,⁵ so that the genitalia must be used as a criterion for generic differences.

A dissection of the animal establishes the position of *monticola* in *Macrochlamys*. In *Austenia planospira* the albuminiparous gland is small and kidney shaped, while the uterus is covered with a heavy, smooth lumen, which hides the saccules. In *Euaustenia cassida* the uterus is narrow and filled with small granulose saccules, which are visible through the lumen. The flagellar portion (coecum) of the epiphallus is coiled. The vas deferens describes a loop between the uterus and the epiphallus, and enters the latter about midway in the last coil. The amatorial gland is straight and fairly thick. *Macrochlamys monticola* is very strikingly similar to *Macrochlamys indica* as figured by Godwin-Austen.⁶ The uterus is long and dilately sacculate as in *M. indica*. The saccules are thicker and heavier than in *Euaustenia cassida*, while the uterus is thicker. In the latter respect *M. indica* and *M. monticola* are precisely alike. The albuminiparous gland is thick and conical in outline, with a wide depression on the columellar side. The ovotestis shades off into the talon about midway from the apex of the albuminiparous gland.

M. monticola further differs from *E. cassida* in the following ways: the flagellar portion of the epiphallus is more intensely coiled; the vas deferens is thinner, longer, and with a greater loop, and joins the epiphallus just beneath the last coil of the flagellum on the columellar side; the spermathecal duct is shorter, while the spermatheca is more tumid; the amatorial gland is curved downward. In all ways men-

1. 1882, Land and Freshwater Mollusca of India, Part IV, p. 234.

2. 1908. Fauna of British India, Mollusca, Testacellidæ and Zonitidæ, p. 149.

3. 1891, A.M.N.H. (6) vii, p. 98.

4. loc. cit.

5. 1882, Land and Freshwater Mollusca of India, Part IV, p. 149.

6. 1910, Jour. of Conch., Vol. 13, p. 38, fig. A.

tioned above *M. monticola* is like *M. indica*. Indeed, the resemblance between the two is so striking that the generic position of *M. monticola* is beyond question.

The specimens dissected by myself were received from M. M. Carlton, Jan. 1872 by the Museum of Comparative Zoology, Cambridge, Massachusetts. Locality: Suttly River, near Billispur, Lower Himalayas, North India, M.C.Z. 79776.

[The locality is evidently Bilaspur, on the Sutlej, of present-day maps. It is about 30 miles north-west of Simla.—Ed.]

Some Peruvian Mollusca.—In 1911, the Oxford geologist, Mr. J. Douglas, was investigating the coastal desert of South Peru, and incidentally brought back a small collection of mollusca from the edge of the plain, near Arequipa. This has lately come into my hands and seemed sufficiently interesting to justify the publication of a list of species, for which I am indebted to the kindness and knowledge of Mr. J. R. le B. Tomlin. The following were found: **Epiphragmophora alsophila** Phil., five specimens, in two well-marked varieties, two specimens being slightly smaller, much darker and more convex than the remainder. **Thaumastus tarmensis** Phil., eight specimens. **Bulimulus (Geopyrgus) turritus**, Brod., seven specimens, varying somewhat in the degree of angulation of the lower whorl. **B. (Scutalus) proteus** Brod., seven specimens. **Neopetræus** sp., two shells, varying considerably in height and in depth of suture, but clearly of one species, very close to *B. decussatus*, Pfr. **Drymæus subinterruptus**, Pfr., two specimens. **Nenia lubomirskii**, Polinski, one specimen.—L. W. GRENSTED.

CYMBIUM ÆTHIOPICUM, Linn. var. AURANTIUM, nov.

 By S. G. FINCH.

(Read before the Society, March 5th, 1930).

SHELL rather oblong-ovate, attenuated at each end, deep orange-cream, faintly banded with chestnut-brown, whorls rather depressly channelled round the upper part, regularly coronated with rather short scales, columella three-plaited, aperture interior deep-cream, shaded and streaked towards the lip with reddish-orange, lip and columella deep reddish-orange.

Hab. ?

Type. In British Museum, (Cuming Coll.). Figured by Reeve in the "Conchologia Iconica," Monograph of Cymbium, Pl. 2. Figs. 1b. 1c.

A second figure of this beautiful variety is given in Sowerby's "Thesaurus," Vol. I, Pl. LXXXII, Fig. 13.

Note on the spelling of LYMNÆA Lamarck.—There appears to have been a typographical error in Lamarck's paper (Mém. Soc. Hist. Nat. Paris. I, p. 75, 1799) for in the early part of the paper the spelling is *Lymnæa*: altered in the later pages to *Lymnæa*. This is duly noted by Kennard and Woodward in their "Synonymy of the British Non-marine Mollusca," p. 41, 1926. That the "œ" was a misprint is therefore obvious. Is this equally so in the case of the "y" which is retained throughout the paper and in Lamarck's "Anim. sans Vertèbres," vi (second part), p. 57. and vii, p. 543? In article 19 of the International Rules it distinctly states that "The original orthography of a name is to be preserved unless an error of transcription, a *lapsus calami*, or a typographical error is evident." Although *Lymnæa* (Λιμνη, a marsh) might be rejected from a literary standpoint, strict adherence to the Rules seems to demand its retention.—J. DAVY DEAN (*Read before the Society*, Nov. 6th, 1929).

MARINE MOLLUSCA AT HENGISTBURY HEAD AND CLIFF-END, NEAR CHRISTCHURCH, HANTS.

BY E. ST. JOHN BURTON, F.L.S., F.G.S.

(Read before the Society, November 6th, 1929).

MARINE shells along this part of the Hampshire coast are not, as a rule, cast ashore abundantly as regards the number of species. Compared with the prolific spoils sometimes thrown up in patches of black and coaly material, after south-easterly storms, on the sandy shore extending for four miles between the South Haven, near Poole, and the village of Studland, in Dorset, the total of species obtainable further east near Christchurch appears somewhat meagre.

About 120 marine species of mollusca, of which 65 are bivalves, have been found on the Studland shore, nine miles in a direct line from Hengistbury Head, whereas at the two Hampshire localities I have been able to find at present only 35—18 Pelecypoda, 17 Gastropoda.

A strong current flows past Hengistbury, or Christchurch Head during changes of the tide, and when southerly winds prevail one might reasonably expect that shell-material would be moved and deposited along the shore composed of sand, with heavy flints above high-water mark of spring-tides, and extending from the eastern end of the headland as far as the mouth of the Salmon-Run where the combined waters of the Rivers Stour and Avon enter the sea, the distance from Hengistbury Head being at least one and a quarter miles.

Mollusca are not in a general way common, except occasionally during the autumn or winter months; nor is the majority of species noticed here often cast up in good condition further eastward towards the centre of Christchurch Bay.

The list of species collected at Hengistbury Head is as follows :

Cardium edule L., rarely alive.

Lævicardium norvegicum (Spengler), rare.

Macra stultorum L., not common.

Spisula subtruncata (da Costa), common.

Musculus discors (L.), occasionally plentiful in lobster-pots.

Mytilus edulis L., abundant and often of large size.

Ostrea edulis L., rarely alive.

Pecten opercularis (L.), rarely alive.

Ensis ensis L., not common.

E. siliqua L., common.

Solen vagina L., very common.

Paphia pullastra (Montagu), occasional specimens with valves united.

Tellina tenuis da Costa, not very common.

Buccinum undatum L., common.

Calliostoma zizyphinus (L.), occasional adult small specimens.

Crepidula fornicata (L.), very common, adhering to the shells of *Mytilus edulis* L. Also to those of their own species.

This non-indigenous species has become firmly established along the coast near Christchurch. It has been known for many years in Essex, and later appeared in Sussex. It was noticed in the Solent, some years before 1920, and has since become very common in Christchurch Bay, Bournemouth Bay, and occurs also further westward in Studland Bay, Dorset.

The later records are from Dorset. It would thus be of interest to learn whether *Crepidula fornicata* has succeeded in passing the range of chalk-cliffs and deep water intervening between Hand-fast Point (Studland) and Swanage, and in locating itself still further down the South coast.

Gibbula cineraria (L.), common.

Lacuna vincta (Mont.), abundant on *Fucus serratus*, stony ground.

L. parva (da Costa), not common.

Littorina litorea (L.), not commonly thrown up.

L. obtusata (L.), common.

Ocenebra erinacea (L.), alive on rocks at extreme low tide.

Nassarius reticulatus (L.), more commonly in lobster-pots.

Natica catena (da Costa), occasional specimens alive.

Patella vulgata L., common on rocks.

Patina pellucida (L.), not very common.

Phasianella pullus (L.), abundant, finely marked, in lobster-pots.

Nucella lapillus (L.), large specimens, white, yellow, and brown, living on rocks at low tide mark.

Rissoa parva (da Costa), alive, at low tide.

Trivia europæa (Montagu), not plentiful.

The above species, with the exception of *Musculus*, *Patina*, *Phasianella*, *Lacuna* and *Rissoa*, were collected also at Cliff-End, which is situated one and a half miles N.E. of Hengistbury Head, and consequently within a quarter of a mile of the present opening of the Run, the position of which opening varies very considerably about every twenty to thirty years. In addition, the following were collected at Cliff-End :

Donax vittatus (da Costa), not common. Large specimens with both valves united.

Pandora inæquivalvis (L.), var. *obtus*a Jeffreys, common.

Scrobicularia plana (da Costa), common.

Abra alba (Wood), not common.

Tellina fabula Gronovius, common.

Sinistral *Helix aspersa*.—On March 22nd, when I was pulling down an old stone wall in the ground here, I came across several colonies of hibernating *H. aspersa*. Amongst these was an exceedingly fine sinistral specimen of large size and beautiful markings.—W. F. LLOYD-JAMES (*Read before the Society*, April 5th, 1930).

***Oxychilus lucidus* (Drap.) in Northumberland.**—On May 7th, 1930, I was searching for specimens on a waste piece of ground, formerly a large garden, in the very heart of Jesmond, Newcastle-on-Tyne and came across five or six living *O. lucidus*. They were in a slight depression under a *Rhododendron* among broken branches and leaves. Two of the specimens were nearly full grown. All were in good condition.—E. PERCY BLACKBURN.

THE SURVIVAL OF *HELICELLA VIRGATA* THROUGH THE WINTER.

By A. E. BOYCOTT.

THE life history of *H. virgata* in the neighbourhood of Plymouth was clearly described by H. R. Bolton in 1852 (*Naturalist*, vol. ii, p. 105). Like the great majority of our land snails, it is an annual; it becomes adult in September. Towards the end of October the snails begin to disappear and by December nearly all have retired among the roots of the grass, etc., where they lay; then they die. The eggs hatch in spring and the young are seen about midsummer.

This account is quite in accord with my own limited experience. A few live specimens may sometimes be found in the spring (i.e. about Easter) but the great majority die in the winter, and during the summer only young and partly grown live snails can be found.

An opportunity occurred in April, 1930, at Beer Head, near Seaton in Devonshire of seeing whether the different colour forms had different survival rates. With the help of Capt. G. C. C. Damant and W. S. Boycott a large number of shells were collected, separated into their varieties and the proportion of live and dead determined. Viewed from above, the shells fell into three well-defined groups: (a) white, whitish and yellowish, i.e. *albicans* and *lutescens*; it was impossible to separate these satisfactorily and old dead *lutescens* are presumably liable to bleach white: (b) with a single band above the periphery: (c) with confluent bands making the shell look purplish black (absent from one locus).

		(a) whitish		(b) banded		(c) <i>nigrescens</i>		total	
		exam.	% alive	exam.	% alive	exam.	% alive	exam.	% alive
Locus 1.	11/4/30.	343	26.0	564	23.0	321	25.1	1228	24.8
„ 2.	12/4/30.	62	64.5	154	64.9	—	—	216	64.8
„ 3.	21/4/30.	191	21.0	475	20.6	103	27.2	769	21.6

Such differences as these are (e.g. between the banded and *nigrescens* from locus 3) are not statistically significant and there is no evidence of any differential survival.

These figures represent nothing more than the proportion of live snails among the specimens which could be found in the places and on the occasions when the collections were made. I believe that they considerably exaggerate the percentage which survive the winter. The shells of those which die in December or January have probably to a considerable extent disappeared by Easter; they are blown away by the wind or sink down deep in the turf while the survivors crawl up into conspicuous positions on the grass and are more easily found.

The loci were all on short turf by the sea, about a mile distant from one another and in very exposed situations. The race of *virgata* is small, 7 or 8 mm. in diameter, an exceptionally large shell measuring 10.3 mm. With the 2213 adults, 31 infants from 1 to 3 mm. in diameter were found, which supports Bolton's statement that the eggs take some time to hatch. About 40 of the live ones were kept in captivity and some survived till June. No eggs were laid.

VITRINA MAJOR IN NORTHUMBERLAND SOUTH,
GLOUCESTER EAST AND DEVON SOUTH.

By A. E. BOYCOTT.

ON March 28th, 1930, the Rev. E. P. Blackburn found an empty *Vitrina* shell near Rothley, eleven miles N.W. of Morpeth in Northumberland, which seems clearly referable to *V. major*, a diagnosis in which Mr. B. B. Woodward concurs. Forty-six *Vitrina*, six alive, collected at the same place on April 26th, were all *pellucida*. In Mr. Blackburn's collection there are also two examples of *major* among a number of *pellucida* collected at Birdlip in Gloucestershire in 1908: I found living specimens nine miles north-east from here at Charlton Abbots in 1928 (this *Journal* vol. XVIII, p. 274). On April 14th I found three fine live *major* and two empty shells in the open wood in Roncombe Goyle, a gully containing the head waters of the Roncombe Stream branch of the River Sid and abutting on the high road from Seaton to Honiton, five miles north-east of Sidmouth. The wood is an ash-oak-hazel wood with some holly and alder and lies on green-sand covered with the débris of the plateau flints and clay: the surface soil and stones gave no fizzle when tested with acid. With *major* there occurred *Limax arborum*, *Arion ater*, *A. circumscriptus*, *A. subfuscus*, *A. minimus*, *Hyalinia cellaria*, *H. alliaria*, *H. nitidula*, *H. pura*, *H. radiatula*, *H. crystallina*, *H. fulva*, *P. rotundata*, *Helix hispida* and *Clausilia rugosa*. Easter seems to be the time *par excellence* to find *V. major*.

MOLLUSCA ON GATEHOLM.

By A. E. ELLIS, B.A.

(Read before the Society, November 6th, 1929).

THE following mollusca were found on Gateholm Island in Pembroke-shire, on September 6th, 1929 :

Lauria cylindracea on *Dactylis glomerata*.

Clausilia rugosa var. **parvula** Turton: the smallest specimen measured 8 mm. in length by 1.8 mm. in breadth, and the largest was 9.5 by 2 mm.

Goniodiscus rotundatus.

Arion ater.

Ashfordia granulata, on *Primula vulgaris*.

Oxychilus cellarium.

O. alliarium and also small numbers of var. **viridula** Jeffreys.

Vitrea crystallina var. **contracta** Westerlund.

Cepæa nemoralis, chiefly on primrose, but also on *Plantago lanceolata* and *Heracleum sphondylium*. The majority of specimens found was immature, but there were a few adults, besides several shells gnawed by rats. The following varieties were recorded: *rubella*: (adult) 00300, 12345, 003(45); (young) 00345, 12345, 00300, 10345, 003:5; *libellula*: (adult) 00045, 00300, 12345, 00345; (young) 12345 (nearly 50 per cent), 00::5, 00045, 1:345, 00005, 00000.

The absence of any species of *Helicella*, for which the island would seem to afford an ideal habitat, is probably due to the large numbers of rabbits present. *H. itala*, *H. caperata* and *H. virgata* occur on the mainland in the vicinity.

On the rocks at the base of the island were large quantities of *Littorina* (*Melarhaphé*) *neritoides* and *L. (Littorivaga) rudis*. Above the *Fucus vesiculosus* zone, on red marl (Devonian), the prevalent form of *L. rudis* was a bright, orange-red var. *jugosa*, but the lower zones were principally populated by a whitish form of var. *sulcata*, which is prevalent in Marloes Bay, except on the red rocks.

The vertical range of *L. rudis* is remarkable: In the *Fucus* zones it is found in association with such species as *Osilinus crassus*, *Gibbula umbilicalis*, *G. cineraria*, *Nucella lapillus*, *Littorina littorea*, *L. littoralis*, *Patella vulgata* and *Mytilus edulis*, while at the opposite extreme it occurs with *L. neritoides*, and even reaches the zone of mosses, lichens, and such terrestrial plants as *Armeria maritima*, *Crithmum maritimum*, *Plantago maritima* and *Festuca ovina*, high up on the rocks, as at Sandy Haven, Pem.

I discovered further evidence of the partiality of rats for *Cepæa nemoralis* and other mollusca on a small stack, connected with the cliffs by a short neck of bare rock, just north of the "Rain," a promontory in St Bride's Bay separating Broad Haven from Settlands. This little peninsula is infested with rats, in and around the burrows of which were large numbers of shells, the majority showing clear signs of having been gnawed by the rodents. These included two land snails, *C. nemoralis* and *Helicella caperata*, which live, together with *Clausilia rugosa*, *Lauria cylindracea*, *Goniodiscus rotundatus* and *Oxychilus cellarium*, on the rock, and the following marine species: *Mytilus edulis*, *Tellina tenuis*, *Patella vulgata*, *Littorina* (*Neritoides*) *littoralis*, *Turritella communis*, *Natica catena* and *Buccinum undatum*. There were also carapaces of the shore crab, *Carcinus mænas*. The height of the rock, the top of which, where the rat burrows are, is clothed with short turf of *Festuca*, eliminates the possibility of any of these having been cast up there by the sea, and all except the land shells must have been fetched from a considerable distance by the rats. The most numerous remains were those of *Cepæa*, Mussels and Limpets; in the capture of the last the rats must exercise a degree of legerdemain which would make the operation an entertaining one to watch, but unfortunately the animals are shy of displaying their prowess. It is evident that mollusca constitute a considerable item in the bill of fare of maritime rats, which, judging from their abundance along the shore, appear to flourish exceedingly on this diet.

I am indebted to Mr. R. Winckworth for his kind assistance with the nomenclature of the marine species.



PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN & IRELAND.

579th Meeting, held at the Manchester Museum, January 8th, 1930.

Mr. G. C. Spence in the chair.

Addition to Library.

"Eine für Japan neue linksgewundene Schnecke," by Shintaro Hirase (from the author).

New Member Elected.

John Vivian Dacie.

Candidates Proposed for Membership.

Allan Archer, 20, Derne Street, Boston, Mass., U.S.A., Harold A. Rehder, 62, Orchard Street, Jamaica Plain, Mass., U.S.A. (both introduced by W. J. Clench and J. R. le B. Tomlin). Ivar Agrell, stud. zoolog., Gyllenkroksgatan 1, Lund, Sweden (introduced by H. Schlesch and W. T. Elliott). Ranald MacDonald, 94, Antrim Road, Belfast (introduced by R. J. Welch and J. W. Jackson).

Resignations.

Ellis Crapper. Rev. Dr. S. G. Brade-Birks.

Member Deceased.

George W. Young.

Papers Read.

"Report of Yorkshire Branch," by J. R. Dibb.

"Unionicola ypsilophora parasitic in *Anodonta cygnea*," by Mrs. Morehouse.

Exhibits.

By Dr. J. Wilfrid Jackson: —A series of shells from Roman Colchester, including *Ostrea edulis*, *Mytilus edulis*, *Buccinum undatum* and *Helix aspersa*. The special exhibit was *Opisthostoma*.

580th Meeting, held at the Manchester Museum, February 5th, 1930.

Mr. G. C. Spence in the chair.

Additions to Library.

"Recherches sur l'anatomie et la place systématique du genre *Agardhia* Gude," by Dr. C. M. Steenberg (from the author).

"Quantitative Researches concerning the Land-Fauna, especially the Molluscs" (and two other papers on the same subject) by Fridthjof Ökland (from the author).

Turton's "Manual of the Land and Fresh-water Shells of the British Isles," by J. Edw. Gray, and "Manual of the Mollusca," by S. P. Woodward, both presented by Lt-Col. W. H. Turton.

New Members Elected.

Allan Archer, Harold A. Rehder, Ivar Agrell, Ranald MacDonald.

Papers Read.

"Obituary: James Cosmo Melvill," by Dr. J. Wilfrid Jackson.

"*Acanthinula lamellata* in North Staffs," by J. & W. Hill.

"Additional Notes on the Land and Freshwater Mollusca of Sussex," by J. Gordon Dalgliesh.

"*Helix aspersa* with translucent markings." by L. E. Adams.

The Relationship of *Ibycus siamensis* Ckll. 1891," by Professor T. D. A. Cockerell.

"Additions to the Mollusca of Albert Nyanza," by M. Connolly.

Exhibits.

The special exhibit was *Melania*.

581st Meeting, held at the Manchester Museum, March 5th, 1930.

Mr. G. C. Spence in the chair.

Additions to Library.

"New Land and Freshwater Molluscs from South America" by W. B. Marshall (from the author).

"Mollusca (Pelecypoda, Scaphopoda, Gastropoda, Opisthobranchia) of the Irish Atlantic Slope," by Anne L. Massy (from the author).

Collection of reprints of his own papers, presented by Major M. Connolly.

Collection of reprints of papers by Wm. J. Clench, presented by G. C. Spence.

Portrait of himself, presented by Professor Shintaro Hirase.

Candidate Proposed for Membership.

Miguel L. Jaume, Calle 19 entre 8 y 6, Vedado, Habana, Cuba (introduced by Hans Schlesch and Dr. Elliott).

Member Struck Off.

One member was struck off the List in accordance with Rule 4.

Paper Read.

"*Cymbium aethiopicum*, L. var. *aurantium* nov." by S. G. Finch.

The Special Exhibit was *Haliotis*.

582nd Meeting, held at the Manchester Museum, April 5th, 1930.

Mr. G. C. Spence in the chair.

New Member Elected.

Miguel L. Jaume.

Candidate Proposed for Membership.

Douglas Keely Kevan, F.C.R.A., 31, Nile Grove, Edinburgh (introduced by Drs. A. E. Boycott and J. W. Jackson).

Papers Read.

"The Genus *Alopi* H. & A. Adams, 1855," by the Rev. A. H. Cooke, Sc.D.

"Sinistral *Helix aspersa* at Middle Barton, Oxon," by W. F. Lloyd-James.

Exhibits.

By Mrs. Morehouse:—Shell-trumpets made from *Triton* and *Cassis cornuta* from Madagascar.

By Mr. C. H. Moore:—*Petricola pholadiformis* Lam. and *Crepidula fornicata* L. from U.S.A., *Barnea candida* L., *Teredo norvegica* Sp., etc.

The Special Exhibit was *Ampullaria*.

583rd Meeting, held at the Manchester Museum, May 3rd, 1930.

Mr. G. C. Spence in the chair.

New Member Elected.

D. K. Kevan.

Exhibits.

By Mrs. Morehouse:—*Testacella scutulum* from Christchurch Nurseries, Doncaster.

By Mr. G. C. Spence:—Series of *Planispira*.

By Mr. C. H. Moore:—*Septaria haustrum* Rve., *S. elliptica* Lam., *Trophon liratus* Couth. (Falkland Is.) and *Nassarius arcularia* L.

The Special Exhibit was *Cochlostyla*.

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THE
JOURNAL OF CONCHOLOGY.

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DECEMBER, 1930.

No. 3.

MILAX GRACILIS (Leydig) IN THE BRITISH ISLES.

By R. A. PHILLIPS, M.R.I.A., AND HUGH WATSON, M.A.

(Read before the Society, September 13th, 1930).

PLATES I AND II.

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PART I.

By R. A. PHILLIPS, M.R.I.A.

DISCOVERY OF *MILAX GRACILIS* (Leydig)
IN IRELAND.

DURING the past few years I frequently observed, in a casual way, that *Milax sowerbii*, as represented in my garden at Cork, appeared to vary considerably in size and colour. My interest in the subject was more fully aroused one evening in September 1928, when on turning over an individual I noticed that it possessed a narrow, almost black footsole.

Immediate comparison of that remarkable looking specimen with typical *Milax sowerbii* showed that they differed from each other in several details, and subsequent searches in the garden, often continued at night when the animals were moving about, revealed the facts that the dark-soled form was much more plentiful and uniformly smaller than the normal *M. sowerbii*.

Among the numerous recognised varieties of *M. sowerbii* and *M. gagates* described and illustrated in the works of writers on British Mollusca nothing could be found similar to or identical with this strange slug. Moreover, on searching for the same form in other Irish gardens I was pleased to find it living in several widely separated localities, thus proving that it was more than a mere local variety.

Close observation of the animal in the living state during the following months, and superficial dissection of preserved specimens which showed that the internal shell was distinct in form and character, led me to conclude that I had discovered a slug which was specifically distinct from both *M. sowerbii* and *M. gagates*; but whether it was new to science or a species known elsewhere and overlooked in the British Isles I was unable to ascertain, though specimens were sent for identification to various malacologists, until Mr. Hugh Watson, to whom I sent specimens in the autumn of 1929, very kindly undertook the task of looking into the question.

In a short time Watson, by skilful dissection and comparison of the internal organs of the strange form with those of the two known British species of *Milax*, proved that it was specifically distinct from both and finally identified it as being conspecific with the slug known on the European continent as *Milax gracilis* (Leydig).

The following is a translation of the essential parts of Leydig's original description.¹

"Species 2: *Limax gracilis*, nov. spec.

Shield granulate; the keel extends throughout the entire length of the back; upper side blackish to black; shield without the lateral streaks; keel dirty yellow, sole blackish grey.

. . . I have collected this slug in a fair number of specimens and convinced myself that it is a good species. The animal is much smaller than the most nearly related *L. carinatus*,² when crawling about $1\frac{1}{2}$ -2 inches long, but in that state is of extreme slenderness. The upper side ranges from a dirty ochre (or rather greyish yellow with blackish little streaks) to a quite dark, almost black, colour, with traces of yellow laterally; tentacles blackish; under side blackish grey; shield marbled, without developing the large lateral spots which are present in *L. carinatus*. The keel, passing along the whole back, is yellowish. The dermal mucus is viscous, as in *L. carinatus*, and is tinged with yellow.

The shell is longish, very narrow, and thus to some extent in accordance with the style of the body . . ."

Leydig's description agrees fairly closely with the Irish form, and so do the particulars that Dr. H. Simroth gives about *Milax gracilis* in his works on the slugs of Germany³ and of the Southern Alps.⁴

¹ Arch. f. Naturgesch., vol. xlii (1), 1876, p. 276.

² *Limax carinatus* Leydig = *Milax marginatus* (Drap.), not *M. carinatus* (Risso).

³ Zeitschr. f. Wissensch. Zool., vol. xlii, 1885, p. 337 (see also Geyer: "Unsere Land- und Süßwasser-Mollusken," 1927, p. 67).

⁴ Abhandl. d. Senckenb. Naturforsch. Gesells., vol. xxxii, 1910, p. 330, pl. xxiv, figs. 29-32.

In the latter paper Simroth gives coloured drawings of this species. In his figures of the footsole, however, the middle area is depicted as being of a lighter colour than the side areas, whereas in all the Irish examples seen by me the middle area is the darkest. But this discrepancy does not seem to have any significance as, in his earlier work, Simroth states that the sole is grey but in some individuals the middle and in others the sides are lighter. Moreover in English specimens this character is also subject to some variation.⁵

My thanks are here due to Dr. R. F. Scharff and Mr. A. W. Stelfox for the loan of works by continental authors, and for translations of descriptive and other references to *Milax gracilis*.

EXTERNAL CHARACTERS AND SHELL.

As the existence of *Milax gracilis* in the British Isles has hitherto been unknown, the external characters of the animal, as observed in specimens from various Irish localities, are here described in detail, with notes in parallel column indicating the principal features in which *M. sowerbii*, its closest British ally, differs from it.

Most of these distinctions are clearly shown in Watson's accurate and life-like drawings on the accompanying plate and figures in the text.

Milax gracilis.

Animal when fully extended very slender, almost cylindrical except at the caudal end, which is slightly compressed and curves abruptly to the extremity.

Length 2 to 3 inches, when fully extended.

The body is deeply furrowed with long, approximately parallel, black grooves, which are connected by transverse grooves and form a regular series of elongated tubercles. On the sides the grooves slope posteriorly from the edge of the mantle to the foot.

Keel comparatively broad and low, usually pale yellow.

Milax sowerbii.

Animal when fully extended somewhat compressed and sharply keeled. Caudal end sloping gradually to a point.

Length $2\frac{1}{2}$ to $3\frac{1}{2}$ inches.

Grooves closer together, more numerous, and rather shallower and paler; tubercles shorter and less regularly arranged.

Keel narrow, more erect, usually deep yellow or orange.

⁵ See p. 90.

Milax gracilis [contd.].

The back is yellowish, densely sprinkled and lineolated with black, the sides becoming ashy grey towards the foot.

Shield yellow, densely mottled with black, granulate and pitted.

Respiratory orifice narrow, with dark grey lip which renders it inconspicuous.

Reproductive orifice comparatively large, with a whitish crenulate lip.

Neck slender, dark grey, its dorsal parallel grooves dark grey.

Tentacles rather short, grey thickly beset with black specks.

Foot-sole narrow, speckled grey, longitudinally tripartite, the middle area dark grey or sometimes black, the side areas paler in Irish specimens. The longitudinal grooves and transverse locomotor wrinkles deep and well marked.

Foot margin a single row of tubercles, ashy grey, separated from the body by a deep furrow, along which runs a row of black dots corresponding with the terminations of the locomotor wrinkles.

Dermal mucus somewhat viscous, colourless, but becoming pale yellow on the body, deeper yellow on the mantle when the animal is rubbed or irritated.

Shell narrow, elongate-oval, truncated at apical end, of a light reddish or rusty colour, slightly convex above, concave, or rarely flat, below; nucleus median, almost terminal. Length 3 mm., breadth $1\frac{2}{3}$ mm.

Milax sowerbii [contd.].

Back variable in colour but often with a redder tinge and slightly paler, especially towards the foot.

Respiratory orifice large, with pale lip, conspicuous.

Reproductive orifice relatively smaller and less prominent.

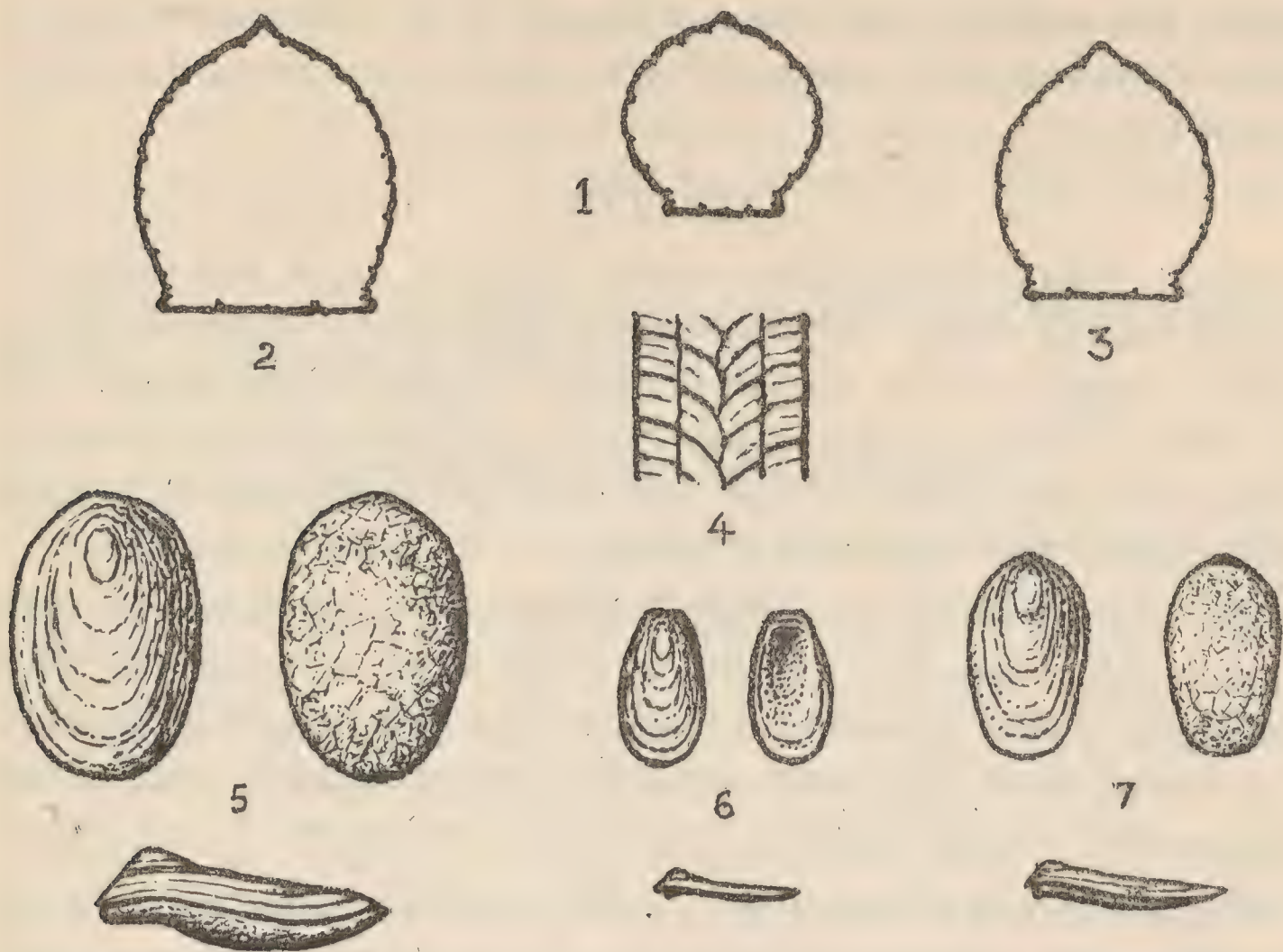
Tentacles shorter and stouter in proportion.

Foot-sole broad, uniformly pale yellow. Locomotor wrinkles not so deep or so regularly arranged.

Foot margin paler, the black dots along the peripodial groove absent or very sparsely represented.

Dermal mucus deep yellow when the animal is irritated.

Shell oblong-oval, pure white, usually thick and solid when adult. Length 5 mm., breadth $3\frac{1}{4}$ mm.



TEXT-FIGURES 1-7.

- | | | |
|---------|--|---|
| Fig. 1. | <i>Milax gracilis</i> (Leydig) | } Approximate outlines of transverse sections
through the animal behind the mantle; $\times 2$. |
| Fig. 2. | <i>Milax sowerbii</i> (Fér.) | |
| Fig. 3. | <i>Milax gagates</i> (Drap.) | |
| Fig. 4. | <i>Milax gracilis</i> (Leydig); Gardiner's Hill, Cork. Grooves on footsole;
$\times 3\frac{1}{2}$. | |
| Fig. 5. | <i>Milax sowerbii</i> (Fér.); Thurles, Co. Tipperary
(Nov., 1928). | } Shell, from above,
from below, and
from the side; $\times 4$. |
| Fig. 6. | <i>Milax gracilis</i> (Leydig); Gardiner's Hill, Cork
(Nov., 1928). | |
| Fig. 7. | <i>Milax gagates</i> , (Drap.); Thurles, Co. Tipperary
(Nov., 1929). | |

Looked at superficially from above *M. gracilis* might be, and probably has been, mistaken for a young or small dark form of *M. sowerbii*; but it may readily be distinguished from that species by its narrow, darkly-coloured footsole, as well as by its more widely separated dermal grooves, its more slender and cylindrical form, and by the blunt appearance of the hinder extremity when seen from the side. From *M. gagates* it is easily separated by the same characters, and also by its paler keel and more rugose body.

When the animal is preserved in spirit the yellow colouring matter on the body, keel and mantle disappears, leaving the skin pale grey, densely lineolated and spotted with black.

In Ireland *M. gracilis* shows very little external variation except in the amount of black pigment present, some individuals being darker and others paler than the majority. The keel, though usually pale

yellow, is sometimes grey or rarely almost black. Some individuals lack the internal shell, in others it is represented only by a thin transparent film.

HABITS.

Milax gracilis lives under stones, decaying wood and prostrate thickly matted plants. Under stones, flower pots or boxes which are closely pressed on the ground it makes a burrow which seems to be its home; I have on some occasions observed these burrows occupied during the day, empty at night and again occupied, each apparently by the same individual, next morning.

The species, where plentiful, is gregarious, large numbers often lying huddled together. Under a small block of wood $16 \times 3 \times 3$ inches lying on a flower bed I have counted twenty-eight individuals, and I have seen thirty-seven specimens congregated in a space four inches square beneath a stone the full size of which was 11×8 inches.

Though usually accompanied by *M. sowerbii* in those habitats, the two species do not as a rule associate, but gather in separate groups. When resting, *M. gracilis* rarely assumes the contracted and almost hemispherical shape so characteristic of *M. gagates* and *M. sowerbii*; it usually lies with its body partially extended and often curved sideways in a semicircle or sometimes bent like a hairpin.

It is of more active habits and hardier than *M. sowerbii*, being one of the earliest slugs abroad after dusk and venturing forth in colder and drier weather than its congeners. In my garden which possesses a slug fauna of eleven species all moving in damp, mild weather, on many nights, especially in winter, the only species to be seen are *Milax gracilis*, *Agriolimax agrestis* and *Arion hortensis*; frost, dry east wind and continued heavy rain are the only weather conditions during which these three species are confined to their sheltered retreats.

M. sowerbii seems to be more susceptible to the effects of extreme cold than *M. gracilis*, as, after a few nights of severe frost, I have frequently found, under stones and wood, dead or dying specimens of the former, the latter species in the same colonies being quite unharmed.

When abroad, *M. gracilis* remains on the ground; I have never seen it ascending the stems or leaves of plants. It feeds on seedlings, young tender plant shoots, exposed bulbs and tubers, and decaying vegetation, but deserts these for animal food when available in the form of dead slugs, snails, worms or insects. In common with several other species it is irresistibly attracted by bread crumbs and meat fragments placed on garden paths for birds.

The conjugation of *M. gracilis* takes place during the winter months, December to March, and the operation is very protracted. Of two pairs I had under observation in December, one couple remained united for over forty-eight hours and the other for at least twenty-four hours.

The young appear early in spring and almost immediately assume the form and colouring of the adults.

DISTRIBUTION IN IRELAND.

The distribution of *Milax gracilis* has not yet been fully worked out, but I have already found the species in the following Irish county divisions:

MID CORK.—Plentiful in a garden on the Douglas Road, near Cork, south of the River Lee; Dec. 26th, 1928 and on other occasions.

EAST CORK.—Abundant in my flower garden, and in an adjacent garden, on Gardiner's Hill, a suburb of Cork City, about one mile north of the River Lee; I first observed the form soon after taking up residence there in February, 1921, but did not realize that it was quite distinct from *M. sowerbii* until September, 1928.

Also plentiful in the rock garden at Ashbourne, Glounthaune, six miles east of Cork, June, 1930.

CLARE.—Very abundant in a large derelict garden and in the surrounding shrubberies at Ennistymon, February, 1929 and on many subsequent dates. Also in a shrubbery near Ballyvaughan, a village on Galway Bay in the extreme north of the county, May, 1930.

KILKENNY.—Sparingly in a garden near Kilkenny, November, 1929 and March, 1930.

These localities are widely separated and I have no doubt that when the animal is specially searched for throughout the country it will be discovered in many other parts of Ireland, and it will probably be found to have a wide distribution in Great Britain also.

PART II.

By HUGH WATSON, M.A.

ANATOMY.

THE following notes are mainly based upon an examination of several specimens of *Milax gracilis* (Leydig), collected by Mr. R. A. Phillips in his garden at Cork in October, 1929; a smaller number which he collected at Ennistymon, Co. Clare, in the preceding month; and a single example of the same species which he found at Kilkenny in November, 1929.

PALLIAL ORGANS AND ARTERIES.

The form and arrangement of the various pallial organs may be seen from plate ii, fig. 5, which represents them as viewed from below, the organs towards the right side of the animal being consequently towards the left in the drawing.

The kidney is somewhat redder than is usually the case in *Milax sowerbii* or *M. gagates*. It has a ventral extension towards the right, as in the other members of the genus.

The heart is situated in the pericardium in front of the left half of the kidney. It lies somewhat obliquely, the muscular ventricle being to the left of and slightly behind the thin-walled auricle.

The aorta runs backwards from the ventricle to pass through the forwardly directed loop of the intestine, where it gives off the posterior aorta. This vessel passes backwards almost in the centre of the posterior half of the animal, and gives off numerous short branches to the liver, the intestine, and the ovotestis.

The main or anterior aorta then passes forwards, giving off as it does so an artery to the spermoviduct, and, in front of this, a large vessel to the middle of the crop. A little further forwards two more branches pass to the salivary glands and the anterior end of the crop, and another one, which usually arises between these two, passes upwards to the pallial organs, bifurcating as it does so, one branch passing towards the hinder edge of the mantle and the other towards its right side.

On reaching the central nervous system the anterior aorta passes between the visceral and pedal ganglia and seems to divide into six branches: first the right posterior cephalic artery and the median buccal artery that passes upwards to the buccal mass; then the left posterior cephalic artery; and, lastly, the right and left anterior cephalic arteries, and the median pedal artery, which curves downwards and backwards to the pedal gland and the foot.

In *Milax sowerbii* and *M. gagates* the vascular system is, on the whole, very similar to that of *M. gracilis*, except that there are usually two arteries to the crop and salivary glands, instead of three. But in all the species the branches of the anterior aorta show a certain amount of individual variation.

PEDAL GLAND.

The pedal gland lies in the anterior half of the body cavity beneath the other organs, and attains a total length of 12 or 13 mm., although its posterior part is destitute of glandular tissue. The anterior glandular portion forms a flattened ribbon usually about 8 mm. in length, and increasing in breadth from about 1 mm. near the front end to nearly 1.4 mm. towards its hinder end (pl. ii, fig. 1). The median duct, or canal, can be clearly seen running along the centre of the upper surface. Near the hinder end of the glandular part the duct becomes narrower, but it is continued beyond it for a considerable distance as a blind tube, which is usually 4-6 mm. in length, although in a single example from St. Leonards-on-Sea it is only about 1.5 mm. long. Both this free portion of the duct and the part embedded in the glandular tissue are frequently more or less tinged with brown except towards the anterior end where the opening is situated. The pedal artery, after supplying blood to the secretory part of the gland, continues along the posterior prolongation of its duct, as shown in the figure.

The detailed structure and physiology of the pedal gland of *Milax gracilis* have been dealt with in an interesting paper by Miss R. Aileen Barr.¹ Unfortunately, however, she mistook the species for *M. sowerbii* (Fér.), and she also assumed that this type of pedal gland was characteristic of the genus *Milax* as a whole, an assumption which is only partly correct.

In *Milax sowerbii* the pedal gland forms a ribbon, usually about 12 mm. long by 1.5 mm. wide, and of approximately equal breadth throughout, the glandular tissue extending quite to the posterior extremity, where the median duct also terminates (pl. ii, fig. 3). The pedal artery runs along the upper surface of the gland, as in *M. gracilis*, but it bifurcates before reaching the hinder end, the two branches passing on to the foot from the outer angles of the posterior end of the gland.

In *Milax gagates* the pedal gland is of the same general type as in *M. sowerbii*, but it is not quite so long; the artery, in the specimens dissected, does not bifurcate before reaching the hinder end of the

1 Quart. Journ. Microscop. Science, vol. lxx, Dec. 1926, pp. 647-667, pls. 33, 34.

gland; and the posterior extremity of the duct or canal usually projects slightly beyond the glandular tissue on either side of it, though not more than about $\frac{1}{4}$ mm. (pl. ii, fig. 4).

Perhaps the fact that the glandular tissue does not extend as far back in *M. gracilis* as in the other species may be due to the narrower footsole of *M. gracilis* requiring less locomotory mucus; while the posterior part of the duct or canal may be retained on account of the excretory function that Miss Barr has shown it to possess. It may be remarked, however, that in the South African genus *Apera*, in which the pedal gland is specially well developed, the posterior part of the duct is also more or less destitute of glandular tissue in most of the species,² and that judging chiefly from its radula, *M. gracilis* approaches more nearly in its habits a carnivorous genus like *Apera* than do the other species of *Milax* found in the British Isles. Moreover, it is chiefly in carnivorous families, such as the Testacellidæ, Aperidæ, Rhytididæ, and Streptaxidæ, that the pedal gland lies in the body-cavity, instead of being embedded in the muscles of the foot. This disposition, however, is found in all the species of *Milax*, and it is conceivable that it is merely due to the body-cavity being deepened in order to make more room, in the predaceous forms for the enlarged odontophore, and in *Milax* for the glands of the genital atrium, as well as for the other organs displaced from the anterior part of the reduced visceral hump.

CENTRAL NERVOUS SYSTEM.

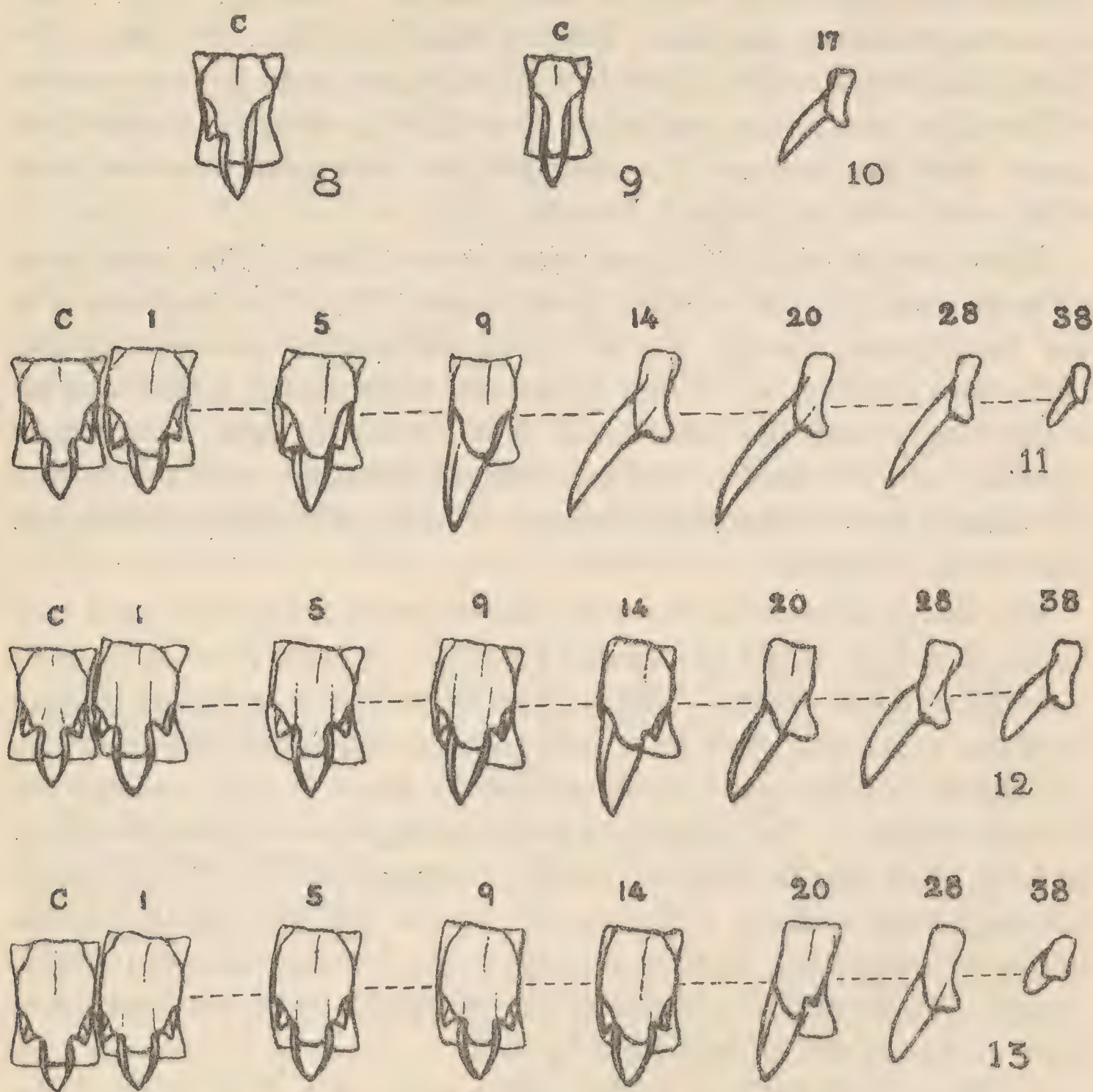
The nerve-ring (pl. ii, fig. 2) surrounds the front end of the œsophagus, salivary ducts, and buccal retractors, being too small for the buccal mass to be withdrawn through it. The cerebral ganglia are well developed, with large and conspicuous lateral lobes. They are united by a rather short and broad cerebral commissure, and a slender sub-cerebral commissure not shown in the drawing. The buccal ganglia are of a long oval form, and are united by a commissure about .5 mm. in length. The cerebro-pedal and cerebro-pleural connectives are unusually short. The ventral ganglia are all closely aggregated, the visceral ganglia being immediately above the pedal ganglia and in intimate contact with one another; indeed, the abdominal ganglion seems to be more or less completely fused with the left parietal ganglion, as may be seen from the drawing.

The central nervous system of the other species of *Milax* is, on the whole, very similar to that of *M. gracilis*, although in *M. sowerbii* the cerebro-pedal and cerebro-pleural connectives are not quite so short, and in *M. gagates* the cerebral commissure appears to be slightly thicker.

² Annals Natal Museum, vol. iii, 1915, pp. 131-136, pl. xiii.

DIGESTIVE SYSTEM.

The jaw measures about .5 mm. in height and 1.5 mm. in breadth, and is of the usual oxygnathous type found also in the other species of *Milax*, as will be seen from pl. ii, fig. 13.



TEXT-FIGURES 8-13.

Representative teeth from the radulae of Irish *Milaxes*; $\times 250$.

Fig. 8. *Milax gracilis* (Leydig). Abnormal central tooth of a specimen from Ennistymon, Co. Clare (Sept., 1929).

Fig. 9. *Milax gracilis* (Leydig). Abnormal central tooth of another specimen from the same locality.

Fig. 10. *Milax gracilis* (Leydig). Marginal tooth of an immature specimen from Gardiner's Hill, Cork (Oct., 1929).

Fig. 11. *Milax gracilis* (Leydig). Teeth of a normal adult specimen from Gardiner's Hill, Cork (Oct., 1929).

Fig. 12. *Milax sowerbii* (Fér.). Teeth of a normal adult specimen from the same locality as the last.

Fig. 13. *Milax gagates* (Drap.), var. *rava* Williams. Teeth of a normal adult specimen from the same locality.

The radula when flattened out usually measures between 3.2 and 4 mm. in length, and between 1.3 and 1.6 mm. in breadth, and comprises about 100 transverse rows of teeth.

The central tooth is normally tricuspid, and only very slightly smaller than the lateral teeth on each side of it (text-fig. 11 c). But in two specimens, one from Ennistymon, Co. Clare, and the other from Kilkenny, the central tooth is bicuspid, owing to the suppression of the right ectocone in each case (text-fig. 8); while in another example from Ennistymon it is unicuspid and abnormally narrow, both ectocones being suppressed (text-fig. 9).¹

There are 6-8 tricuspid lateral teeth on each side. The inner teeth closely resemble the central tooth, apart from the asymmetry of the basal plates, though the ectocones are slightly shorter than the endocones (text-fig. 11:1); but in the outer laterals the mesocones become longer and the endocones and ectocones less conspicuous (text-fig. 11:5). In the specimen from Ennistymon with the unicuspid central tooth some of the laterals are also without ectocones and abnormally bicuspid.

The marginal teeth have a somewhat crowded appearance, and vary in number from about 30 in small examples to more than 40 on each side in large specimens. The first one or two are transitional in form (text-fig. 11:9), and often show traces of ectocones and endocones, although the former cusps usually disappear about as soon as the latter in this species. The remaining marginal teeth are typically aculeate in form, with narrow bases and single, long and rather slender, sharply pointed cusps (text-fig. 11:14, 20, 28); only at the edges of the radula, where the teeth are smaller, do the cusps become shorter (text-fig. 11:38). In immature specimens the marginal teeth are fewer, and their cusps are not so long (text-fig. 10).

In *Milax sowerbii* the radula has usually about 15 or 20 more transverse rows of teeth than in *M. gracilis*. The central and lateral teeth are of a slightly different shape, as shown in text-fig. 12 (C, 1, 5, 9); the central tooth is distinctly smaller; and there are, as a rule, nearly twice as many tricuspid laterals, their number varying between 10 and 15 on each side. These are followed by two or three transitional teeth, with small ectocones in addition to their large mesocones (text-fig. 12:14); and the cusps of the marginal teeth are shorter than they are in fully grown specimens of *M. gracilis*, and considerably broader (text-fig. 12:20, 28, 38).

The radula of *Milax gagates* differs still more from that of *M. gracilis*. In the central and lateral teeth the bases are slightly longer and the cusps slightly shorter (text-fig. 13: C, 1, 5, 9, 14), and the

¹ Cf. Hazay: Malakozool. Blätter, N.F., vol. iii, 1881, p. 38, pl. i, fig. c.

laterals are far more numerous, numbering from 15 to more than 20 on each side. The marginal teeth, on the other hand are fewer and not quite so crowded, with much shorter and blunter cusps (text-fig. 13:20, 28, 38), and as many as five or six of the inner marginals retain minute ectocones.

Of the three slightly different types of radula which respectively characterise the three species of *Milax* found in the British Isles, that of *M. gagates* seems on the whole to be the least specialised and resembles most nearly the type found in the more primitive genus *Parmacella*. On the other hand, the radula of *M. gracilis*, when fully developed, becomes the most specialised, and, in the long, sharply pointed cusps of the marginal teeth, the small number of laterals, and perhaps also in the instability of the central tooth, it has clearly become adapted to a more definitely carnivorous diet. But this adaptation has not been carried nearly so far as in the related genera belonging to the Trigonochlamydinæ; for all the species of *Milax* probably eat both animal and vegetable food, and in captivity *M. gracilis* will readily consume green vegetables and roots.

		Left Marginals	Left Laterals	Central	Right Laterals	Right Marginals	Transverse Rows
<i>Milax gracilis</i> (Leydig):							
Ennistymon, Co. Clare	..	(44 +	6 +	1 +	6 +	42) ×	106
Kilkenny ... ..	...	(38 +	6 +	1 +	7 +	38) ×	102
Gardiner's Hill, Cork	...	(36 +	7 +	1 +	7 +	35) ×	93
Chepstow, Monmouth	...	(32 +	8 +	1 +	8 +	32) ×	97
Fallowfield, Manchester	..	(29 +	8 +	1 +	8 +	28) ×	90
Bedford Park, London	...	(33 +	8 +	1 +	8 +	33) ×	91
St. Leonards, Sussex	...	(32 +	7 +	1 +	7 +	32) ×	93
Prague, Bohemia ..	...	(42 +	7 +	1 +	7 +	41) ×	96
<i>Milax sowerbii</i> (Fér.):							
Gardiner's Hill, Cork	...	(38 +	13 +	1 +	14 +	37) ×	116
Cambridge ... ..	...	(33 +	12 +	1 +	12 +	34) ×	115
<i>Milax gagates</i> (var. <i>rava</i> Williams):							
Gardiner's Hill, Cork	...	(29 +	18 +	1 +	17 +	27) ×	96
Cambridge ... ..	...	(28 +	17 +	1 +	16 +	27) ×	93

TABLE showing approximate number of teeth in radulæ of representative specimens of *Milax gracilis* from different localities, with examples of *M. sowerbii* and *M. gagates* for comparison.

The œsophagus, after passing through the nerve-ring, soon enlarges to form the long thin-walled crop. Posteriorly this merges imperceptibly into the stomach, from the hinder end of which the intestine passes forwards and then backwards and finally forwards again to the pallial region, as shown in plate ii, fig. 12, the whole of the posterior part of the alimentary canal having a very pronounced spiral

twist, as in other species of *Milax*. The lobes of the liver or digestive gland are similarly spirally twisted, and discharge by the short hepatic ducts into the hinder end of the stomach.

The somewhat flattened white salivary glands lie against the sides of the crop towards its anterior end, and are separate from each other. Dr. Babor, however, has already described in some detail the salivary and anterior buccal glands of *Milax gracilis*.¹

RETRACTOR MUSCLES.

The cephalic retractors usually arise from a single root at the posterior end of the pallial area (pl. ii, fig. 5C), but they soon divide into two branches, the tentacular and the buccal retractors (text-fig. 14). Three or four millimetres further forward the tentacular retractor divides into the muscles passing to the right and left tentacles, and the buccal retractor is also rather deeply bifurcated.

The penial retractor arises about 1.5 mm. obliquely to the left and in front of the cephalic retractors (pl. ii, fig. 5E, and text-fig. 14), and is inserted in the wall of the epiphallus near the front end of that organ (pl. ii, figs. 9, 10).



TEXT-FIGURES 14-16.

Retractor muscles of Irish *Milaxes*, viewed from above (slightly diagrammatic) ; $\times 5$.

Fig. 14. *Milax gracilis* (Leydig).

Fig. 15. *Milax sowerbii* (Fér.).

Fig. 16. *Milax gagates* (Drap.).

¹ Sitzber. d. königl. böhm. Ges. d. Wiss., Math.-nat. Cl., 1895, No. xxxiv, pp. 12, etc., pls. i, ii.

In *Milax sowerbii* the cephalic retractors are usually rather more deeply divided, the tentacular retractor and the buccal retractor almost invariably arising separately, though close together (text-fig. 15). The rather stout penial retractor arises much nearer to the origin of the other retractors than it does in *M. gracilis*, and it is supplemented by a pair of short muscles which pass to the penis from the adjacent body-wall.

In *Milax gagates*, on the other hand, the tentacular and buccal retractors are usually united for a somewhat longer distance, and the buccal retractor is less deeply cleft (text-fig. 16). Moreover the penial retractor, which is generally quite narrow in this species, arises further forward on the diaphragm. But in all the species the retractor muscles show a certain amount of individual variation.

GENITAL GLANDS AND DUCTS.

The ovotestis or hermaphrodite gland is large, and consists of numerous follicles forming an elongated cluster, spirally twisted like the lobes of the liver among which it lies (pl. ii, fig. 10). The hermaphrodite duct, which runs forward near the posterior aorta, is rather long, and becomes swollen and convoluted near its anterior end. The albumen gland is comparatively small. The spermoviduct is folded on itself, passing forwards, then backwards, and then forwards again. It bears a well-developed prostate gland running throughout its length. The free oviduct is narrow, and attains a length of 5 mm. or more; in front it enters the broader vagina almost at right angles.

The spermatheca or receptaculum seminis lies beside the anterior part of the spermoviduct, and is usually about 4 mm. long (pl. ii, figs. 9, 10). It is oval or subcylindrical in form, and has uniformly thin walls. Its anterior end, however, merges gradually into the posterior end of the receptacular duct, which has much thicker, muscular walls, and also attains a length of about 4 mm. The vagina is about 2 mm. long, and forms a direct continuation of the receptacular duct, although the cavity is narrowed by a small internal protuberance where the opening of the free oviduct is situated (pl. ii, fig. 11). The walls of the vagina are also thick and muscular, and have internal longitudinal folds.

The long and slender vas deferens tends to be loosely convoluted. It passes forwards from the anterior end of the spermoviduct round the left side of the receptacular duct, and then backwards again, to enter the posterior extremity of the epiphallus slightly to one side of the middle. The epiphallus is thick and muscular; but it is narrower anteriorly than in its posterior half, which has a slightly twisted appearance, with a shallow and ill-defined external spiral groove. The

length of the epiphallus varies greatly. In most of the specimens dissected it is rather short, only slightly exceeding 4 mm. in length (pl. ii, fig. 10). But in two of the slugs from Ennistymon, Co. Clare, as well as in one from St. Leonards, Sussex, it is about twice this length, and relatively narrower, as shown in fig. 9; and it is clear that when it secretes the long spermatophore it must necessarily assume this lengthened form.¹

The penis is quite short, and contains a short, thick-lipped penis-papilla, just in front of which is an internal circular fold (pl. ii, fig. 11). At the junction of the penis and the genital atrium a slight swelling with thin folded walls can usually be seen, but it is not at all conspicuous in this species. The atrial glands most commonly form two masses near the anterior end of the vagina, and usually have somewhat the same appearance as the salivary glands, though occasionally the narrow tubules of which they consist are more distinctly separate from one another and thus more nearly resemble those of *Milax sowerbii*. They discharge into the genital atrium, near the opening of the vagina, by several very small and slender ducts. The genital atrium itself is short and broad, and is minutely papillate internally. It contains no sarcobelum. The genital opening has thick, white, folded lips,

The reproductive system of *Milax sowerbii* differs from that of *M. gracilis* in several features, among which the following are, perhaps, the most conspicuous (pl. ii, fig. 14). The spermatheca is mainly situated further forward, but has a narrow posterior prolongation, which gives it a different shape; its walls, also, are usually distinctly veined. The receptacular duct and the vagina are both very much shorter, and are largely hidden by the atrial glands, which are formed of more distinctly separate tubules than they usually are in *M. gracilis*. The epiphallus becomes broader, instead of narrower, towards its anterior end, and posteriorly it terminates in a kind of wide knob delimited by a slight circular constriction. At the junction of the penis and the genital atrium there is a large and conspicuous swelling, with thin, delicately folded walls. The genital atrium contains a short and thick muscular excitatory organ or sarcobelum (pl. ii, fig. 15); and the lips of the genital opening are less folded and not as white.

In *Milax gagates* the reproductive system also differs in many respects from that of *M. gracilis* (pl. ii, fig. 16). Thus, the ovotestis is smaller, and the anterior convoluted part of the hermaphrodite duct is usually much less swollen. The free oviduct, on the other hand, is much broader and relatively shorter than in the other species, and is

¹ Hazay's figure shows an intermediate condition of the epiphallus (Malakozool. Blätter, N.F., vol. iii, 1881, pl. i, fig. e), and Simroth's the lengthened form (Zeitschr. f. wiss. Zool., vol. xlii, 1885, pl. x, fig. 13).

united by connective tissue with the adjacent vas deferens and receptacular duct. The vagina and receptacular duct are shorter than in *M. gracilis*, though not quite so short as in *M. sowerbii*. The epiphallus is smaller than in the other species, and has a low but characteristic, lateral swelling near its posterior end. The atrial glands most usually form a single broad mass lying beneath the male and female ducts. The genital atrium contains a long and bluntly pointed, muscular exitatory organ or sarcobelum, which can be extruded for about 5 mm. (pl. ii, fig. 17).

SPERMATOOZOA.

The head of a spermatozoon of *Milax gracilis* measures about .007 mm. in length by less than .002 mm. in breadth. It is spirally twisted, tapers to a sharp point in front, and is covered with strong and close spiral striæ. The slender tail varies in length between .15 and .175 mm. Its proximal part is surrounded by a very delicate, but rather broad, spiral flange or filament. The transition from the head to the beginning of the tail is abrupt (pl. ii, fig. 8),

The spermatozoa of *Milax sowerbii* differ considerably from those of *M. gracilis*. The head is longer, narrower, and more conspicuously spiral, its length being fully .009 mm. The tail is also longer, its average length being about .24 mm. It looks less abruptly separated from the head in unstained specimens; and under a high power its proximal part has a different appearance from that of *M. gracilis*, as may be seen from the drawing (pl. ii, fig. 7).

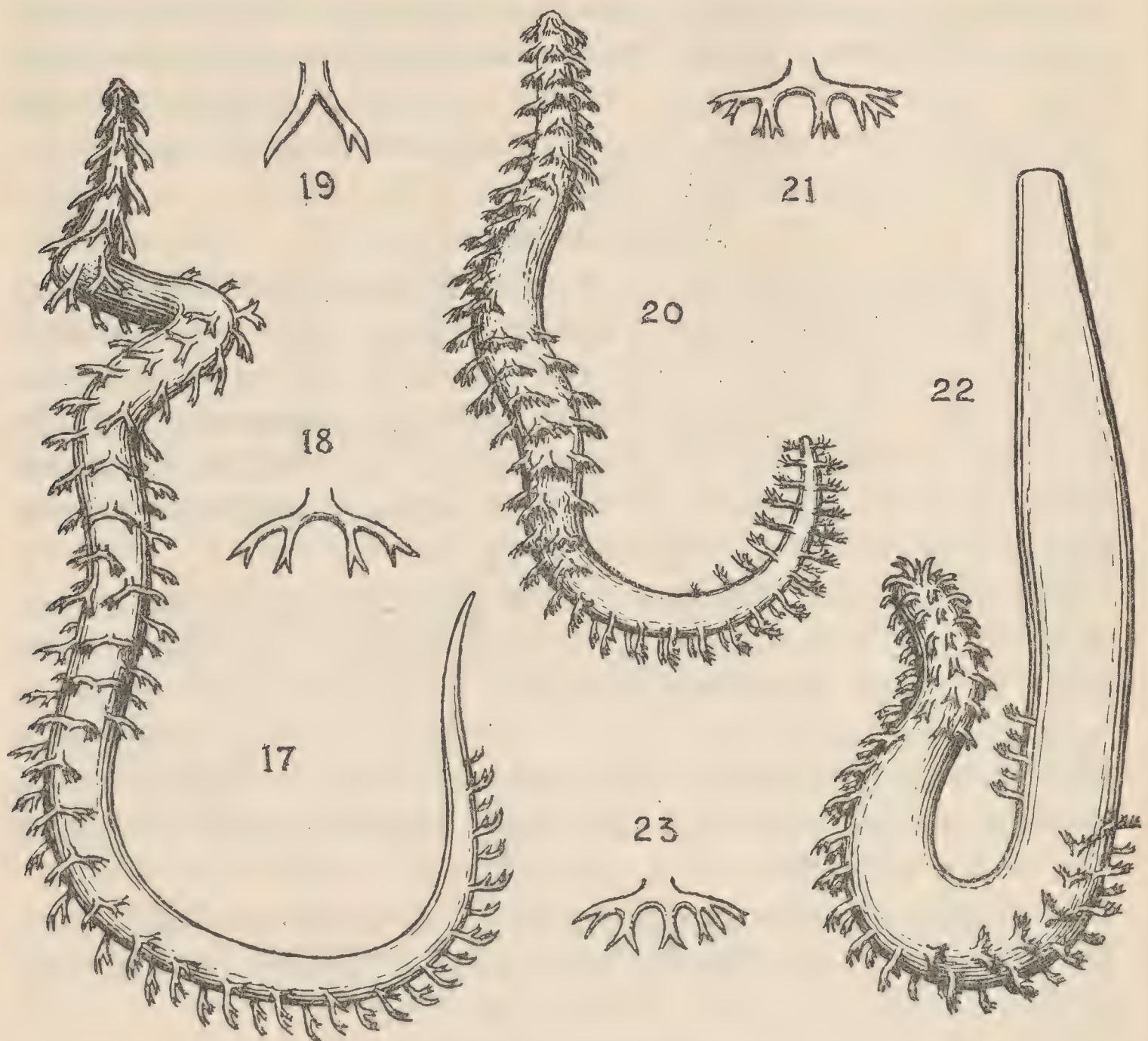
In *Milax gagates* the spermatozoa are more like those of *M. gracilis*, but they are somewhat smaller, the head being about .006 mm. long, and the tail about .13 mm. in length (pl. ii, fig. 6).

SPERMATOPHORE.

The spermatophore of *Milax gracilis* is pale brown, firm, though somewhat flexible, and very long. Its shape and size will be best judged from the accompanying text-fig. 17. It will be seen that one end is spirally twisted, like a cork-screw, while the other is curved round and then tapers to a slender point. This point is smooth for nearly 2 mm., but the rest of the spermatophore is covered with branched spinose processes, except on the inner or concave side of the curved parts. The points of these processes bend towards the smooth end of the spermatophore. At the opposite end each spinose process only divides into 2-4 points (text-fig. 19); but elsewhere they are more branched, having on an average about 8 points each (text-fig. 18).

In *Milax sowerbii* and *M. gagates* the end of the spermatophore that is spirally twisted in *M. gracilis* merely bends once or twice alternately to the right and left in a zig-zag manner, and most of the

spinose processes split up into a larger number of shorter branches (text-figs. 21, 23). But in other respects the spermatophores of these two species differ from each other at least as much as they differ from that of *M. gracilis*.



TEXT-FIGURES 17-23.

Spermatophores of Irish *Milaces*.

Fig. 17. *Milax gracilis* (Leydig). Spermatophore, $\times 8$.

Fig. 18. A single spinose process from about the middle of the spermatophore of the same species; $\times 24$.

Fig. 19. A single spinose process from near the upper end of the spermatophore of the same species; $\times 24$.

Fig. 20. *Milax gagates* (Drap.) Spermatophore, $\times 8$.

Fig. 21. A single spinose process from the spermatophore of the same species; $\times 24$.

Fig. 22. *Milax sowerbii* (Fér.). Spermatophore, $\times 8$.

Fig. 23. A single spinose process from about the middle of the spermatophore of the same species; $\times 24$.

The spermatophore of *Milax sowerbii* is thicker than in the other species; the zig-zag end is much shorter; the succeeding curve is more abrupt; and the smooth end is far more developed, forming about half the entire structure (text-fig. 22).

In *Milax gagates*, on the other hand, the smooth end is absent, the spinose processes extending for the entire length of the spermatophore apart from the inner sides of the curved parts, and being of approximately the same character throughout. Moreover the whole structure is smaller and of a deeper brown colour (text-fig. 20).

It may be added that in both *Milax sowerbii* and *M. gagates* between a quarter and a half of the full-grown specimens dissected contained a spermatophore in the spermatheca; whereas this was not the case in any of the specimens of *M. gracilis* examined (although they were mostly collected at the same time of the year), the spermatophore figured having been found protruding from the genital opening of an animal collected by Mr. Phillips at Cork, in December, 1928.

AFFINITIES.

It has long been known that two quite distinct species of *Milax*—*M. gagates* (Drap.) and *M. sowerbii* (Fér.)—occur in the British Isles; but it will be evident from the above account that we have also a third species which differs considerably from the other two, not only in its external features and shell, but also in its pedal gland, radula, genital ducts, spermatophore, etc. There can be no doubt whatever that this third form is specifically distinct from both *M. gagates* and *M. sowerbii*.

And it is almost equally certain that this species is correctly identified as *Milax gracilis* (Leydig); for it agrees well with the descriptions and figures of this form published by Leydig,¹ Simroth,² and others, as well as with Hazay's original description of *M. budapestensis*,³ which is considered to be the same species.⁴ Moreover I can find no differences between specimens found in the British Isles and examples of *M. gracilis* from Prague in the Collinge collection at Cambridge, collected and identified by Dr. J. F. Babor.

In some respects—such as the form of the spermatozoa, for example—*Milax gracilis* more nearly resembles *M. gagates* than *M. sowerbii*. But in other characters—such as the radula and the free oviduct—it approaches *M. sowerbii* more closely, and on the whole it seems probable that it is more closely related to the latter species than it is to the former. Yet the gap that separates *M. gracilis* from *M. sowerbii* appears to be at least as great as that which separates *M. sowerbii* from *M. gagates*.

¹ Arch. f. Naturgesch., vol. xlii (1), 1876, p. 276, pl. xii, fig. 22.

² Zeitschrift f. wiss. Zoologie, vol. xlii, 1885, pp. 229, 337; Abhandl. d. Senckenb. Naturf. Gesellsch., vol. xxxii, 1910, p. 330, pl. xxiv, figs. 29-32.

³ Malakozool. Blätter, N.F., vol. iii., 1881, p. 37, pl. i, figs. 1, a-f.

⁴ See Simroth, 1885, *loc. cit.*, and Hesse, Abhandl. d. Arch. f. Molluskenkunde, vol. ii, 1926, p. 112. According to these authors, *Amalia cibiniensis* Kimakowicz (1884) is also a synonym of *M. gracilis* (Leydig).

Possibly *Milax gracilis* may be a little more nearly related to the well-known Continental species, *M. marginatus* (Drap.), which resembles it in the length of the receptacular duct and in having no sarcobelum in the genital atrium. But perhaps this latter resemblance may be due to parallel evolution, and in most other respects *M. marginatus* is more like *M. sowerbii*, though it can be distinguished externally from this species (as well as from *M. gracilis*) by its pale, often pinkish ground-colour ornamented with small but well-defined black spots scattered over the body and a conspicuous black band on each side of the mantle. Since *M. marginatus* is not uncommon in France it may turn up in the South of the British Isles, and collectors should therefore keep a look out for it and confirm the identity of doubtful specimens by dissection.

If we were to follow Lessona and Pollonera¹ and attach subgeneric importance to the presence or absence of a sarcobelum or stimulating organ in the genital atrium, then it is clear that *Milax gagates* and *M. sowerbii* should be placed in the *Milax* s.s., as they both possess this organ, while *M. gracilis*, which lacks it, should be placed in the subgenus *Tandonia* L. & P., of which the type is *M. marginatus*. (Drap). Simroth, however, showed many years ago how unnatural is a classification based on this organ;² and it seems better to discard this grouping altogether, rather than to adopt it in the modified form suggested by Hesse, who reduces *Tandonia* to the rank of a section and includes in it species like *M. sowerbii* with a short sarcobelum as well as those with none.³ Not until fuller details have been published of the anatomy of the numerous foreign species of *Milax*, with accurate figures, not only of the genital ducts and glands, but also of the radula, pedal gland, spermatophore, and other organs, will it be possible satisfactorily to classify the members of the genus. Meanwhile I am content to place all three of the British species in *Milax* s.s., although it may be admitted that those who like to split up genera into numerous minor groups, and would assign the British species of *Arion*, for example, to no fewer than five different sections, might well feel justified in placing each of our three species of *Milax* in a separate section of the genus.

Dr. Simroth thought that, judging from its shape and colour, *Milax gracilis* seemed to form a transition towards a number of south-eastern forms that extend from Dalmatia to Syria; and he also considered that this species might be regarded as one of the most

¹ "Monogr. Limacidi Italiani," 1882, p. 54; Mem. R. Acad. Sci. Torino, ser. ii, vol. xxxv, 1884, p. 100.

² Zeitschrift f. wiss. Zoologie, vol. xlii, 1885, p. 340.

³ Abhandl. d. Arch. f. Molluskenkunde, vol. ii., 1926, pp. 33, etc.

ancient members of the group.¹ From our meagre knowledge of the anatomy of the species from the Balkan Peninsula and beyond, it seems probable that at least one or two of them will prove to be nearly related to *M. gracilis*, as Simroth suggests. But although I agree that this species is probably older and less advanced in structure than certain of the Continental species of *Milax*, I consider that it is on the whole the least primitive and most specialised of the three species found in the British Isles. This is shown by its pedal gland, by its radula, and probably by the length of the vagina and the absence of a sarcobelum in the genital atrium, as well as by the reduced shell and the slender subcylindrical form of the animal, this last feature being in all probability an adaptation to facilitate burrowing in the soil. Mr. Phillips tells me that he usually finds this species under stones or boards closely pressed on the ground, whereas *M. sowerbii* is oftener found under rather loosely placed stones and plants, although the two species also occur together.

In all the characters just mentioned *Milax gracilis* seems to be more specialised than *M. sowerbii*; but in its retractor muscles, and in the form of the spermatheca, spermatophore, and spermatozoa, the latter species may possibly be the more specialised of the two, and it should certainly not be regarded as the direct ancestor of *M. gracilis*.

Milax gagates is perhaps the least specialised of the three species of *Milax* found in the British Isles. Thus its radula is the most primitive, the teeth that have completely lost their ectocones being seldom as numerous as those that have retained them, whereas they are about twice as numerous in *M. sowerbii* when the animal is full-grown, and four to six times as numerous in adult specimens of *M. gracilis*. Similarly the reproductive system—especially the free oviduct—seems to be of a more generalised type in *M. gagates* than in the other British forms, and both the radula and the genital organs show a nearer approach to those found in the more primitive genus *Parmacella*. I am therefore inclined to regard *M. gagates* as the oldest of the three British species of *Milax*, a view that is supported by the fact that it is the most widely distributed member of the genus. It is true that twenty years ago Simroth expressed the opinion that this was the youngest species of *Milax*.² But he based this view almost entirely on his theory concerning the evolution of the atrial glands in this genus, and ignored the evidence of the radula and most of the other organs. He admitted, however, that the well-developed sarcobelum found in this species was an organ of high antiquity, and he had

¹ Abhandl. d. Senckenb. Naturf. Gesellsch., vol. xxxii, 1910, p. 330.

² "Deutsche Südpolar Expedition 1901-1903," vol. xii, Zool. iv, 1910, p. 162.

difficulty in explaining satisfactorily why the species which he believed to have been most recently evolved should be found over a wider area than any of the others.

In many features *Milax* bears a striking resemblance to the genus *Parmacella* from the Mediterranean Region, as Simroth and Hesse have pointed out, and there can be little doubt that in this genus we have the nearest living representative of the ancestral form from which *Milax* has been evolved. But *Parmacella* is a much more primitive genus than *Milax*: the retractor of the right upper tentacle crosses the penis, the pedal gland is embedded in the muscles of the foot, the mantle and shell are larger, and the shell has a globose spiral protoconch in which the very young animal is said to be contained. In view of these important differences the question arises whether *Milax* has not diverged far enough from *Parmacella* to be placed in a separate subfamily. But the small Caucasian genus *Boettgerilla* Simroth seems to be in some respects intermediate between the two genera (although in one or two features approaching the allied *Trigonochlamydinae*), and perhaps it is best to follow Hesse¹ and emphasise the affinities of *Milax* with *Parmacella* by placing it in the *Parmacellinae*.

The keel extends forward to the mantle in *Parmacella*, *Boettgerilla*, *Aspidoporus*, and *Milax* (*Micromilax*) *cyprius*—which Simroth regarded as a specially primitive member of the genus—as well as in the better known species of *Milax*. It would therefore seem reasonable to regard those species from south-eastern Europe in which the keel is restricted to the hinder end of the animal as being relatively advanced forms which have more completely acquired the usual shape of a slug. Yet although Simroth, in his great work on Russian slugs, laid special stress on the primitive nature of a long keel,² he seemed to regard these species of *Milax* as relatively ancient members of the genus,³ an opinion shared by J. W. Taylor.⁴ The latter author, however, appears to reject the view that *Milax* is related to *Parmacella*, for he has suggested that the genus has been evolved from a hypothetical snail with a bulimoid, hyperstrophically sinistral shell.⁵ He supports this view by stating that in *Milax* the intestine is sinistrally coiled, and the shell, by the position of its apex, etc., shows itself to be the remnant of a sinistral spiral shell. But the intestine is coiled dextrally and not sinistrally, as is well shown in Taylor's own figures (see also pl. ii, fig. 12); and the nucleus of the shell is approximately median

1. Abhandl. d. Arch. f. Molluskenkunde, vol. ii, 1926, p. 31.

2. "Nacktschneckenfauna d. Russ. Reiches," 1901, p. 253.

3. Abhandl. d. Senckenb. Naturf. Gesellsch., vol. xxxii, 1910, p. 335.

4. "Monogr. L. & F. W. Moll. Brit. Isles," vol. ii, 1904, p. 138.

5. Journ. of Conchol., vol. xvii, 1924, pp. 130, 131.

(see figs. 5-7 on p. 69) and occupies the same position that it does in *Parmacella*, where it is clearly dextral. Therefore in my opinion Taylor's view is untenable.

In their anatomy *Milax* and its nearest allies differ considerably from the more typical genera of the Limacidæ, and A. E. Ellis states they have probably been derived from shell-bearing ancestors independently of the Limacidæ and he therefore places them in a separate family.¹ Now slugs of quite different origin often bear a strong superficial resemblance to one another, and it is quite possible that *Milax* and *Parmacella* have been evolved from one group of oxygnathous snails, and *Limax* and *Agriolimax* from another. The evidence in favour of this view, however, seems to be far from conclusive. *Agriolimax* does not differ as much from *Milax* as *Limax* does, and some of the foreign genera of the Limacinæ differ still less, *Eumilax*, for example, having a keel extending forward to the mantle and a shell with a median nucleus. It is true that the differences in the radula and male organs seem to be more constant; but the difference in the radula is no greater than that between the radulæ of *Helix aspersa* Müll. and *H. aperta* Born, and it is at least conceivable that the ancestors of the Limacinæ may have had an epiphallus secreting a spermatophore such as we find in *Milax*, *Parmacella*, and related genera. Therefore, until stronger evidence is forthcoming in favour of the independent origin of the Parmacellinæ and the Limacinæ, I am inclined to regard them as having probably been evolved from the same stem. This seems to have been Simroth's view; but it is more doubtful whether he was right in suggesting that the immediate ancestors of the Limacinæ were to be found among Oriental genera like *Parmarion*, which have a well developed caudal mucous pore. Perhaps the Vitrinidæ, in which there is no such pore, is the most nearly related family to the Limacidæ.

The various members of the Limacidæ found in the British Isles do not readily fall into linear sequence; some are more specialised in one direction, some in another. But possibly the following classification, which differs little from that adopted by Hesse,² may be as good as any that can be devised in the present state of our knowledge. For the sake of brevity only the more important characters will be mentioned.

Subfamily PARMACELLINÆ.

Limacidæ with a well developed epiphallus and spermatophore; accessory organs, when present, developed from atrium or vagina; endocones of lateral teeth separate from mesocones; mantle granulate or punctate, its central part limited by a groove.

1. "British Snails," 1926, p. 252.

2. Abhandl. d. Arch. f. Molluskenkunde, vol. ii, pp. 4-44.

Genus MILAX Gray.

Pedal gland in body-cavity ; right ocular retractor free from penis ; genital opening near mantle-edge ; mantle of moderate size, wholly concealing the shell which has a non-spiral median nucleus.

Section MILAX s.s.

Atrial glands short ; keel extending forward to mantle.

(1) Duct of pedal gland very little longer than the secretory tissue ; between 15 and 24 lateral teeth on each side ; marginals with rather blunt and short cusps ; spermatophore rather small, spinose throughout its length ; sarcobelum long and tapering ; receptacular duct and vagina short ; oviduct broader and shorter than in the other species *M. gagates* (Drap.).

(2) Duct of pedal gland no longer than the secretory tissue ; 10 to 15 lateral teeth on each side ; marginals with rather large cusps ; spermatophore thick, smooth for half its length ; sarcobelum short and broad ; receptacular duct and vagina very short ; spermatheca with a posterior prolongation absent in the other two species *M. sowerbii* (Fér.).

(3) Duct of pedal gland much longer than the secretory tissue ; about 6 to 8 lateral teeth on each side ; marginals with long narrowly pointed cusps ; spermatophore long, with a smooth, slender extremity ; sarcobelum absent ; receptacular duct and vagina of moderate length ; footsole grey, narrower and slightly shorter than in the other species *M. gracilis* (Leydig).

Subfamily LIMACINÆ.

Limacidæ without a well developed epiphallus or spermatophore ; accessory organs, when present, developed from penis ; endocones of lateral teeth more or less united with mesocones ; mantle concentrically wrinkled, without any groove.

Genus AGRIOLIMAX Mörch.

Right ocular retractor free from penis ; intestine with one forwardly directed loop ; right division of liver posterior.

Section AGRIOLIMAX, s.s.

Rectum with a cæcal diverticulum ; penial appendix digitate *A. agrestis* (Lin.).

Section HYDROLIMAX Malm.

Rectum without a cæcal diverticulum ; penial appendix simple *A. lævis* (Müll.).

Genus LIMAX Lin.

Right ocular retractor crossing penis ; intestine with two forwardly directed loops ; left division of liver posterior.

Subgenus LIMAX, s.s.

Penis without an appendix ; radula little specialised.

Section MALACOLIMAX Malm.

Rectum without a cæcal diverticulum ; penis short ; prostate not diverging from oviduct ; receptacular duct opening into atrium *L. tenellus* Nilsson.

Section LIMAX, s.s.

Rectum without a cæcal diverticulum ; penis long ; prostate diverging from oviduct anteriorly ; receptacular duct opening into atrium *L. cinereo-niger* Wolf.
 *L. maximus* Lin.

Section LIMACUS Lehmann.

Rectum with a long cæcal diverticulum ; penis long ; prostate diverging from oviduct anteriorly ; receptacular duct opening into vagina *L. flavus* Lin.

Subgenus LEHMANNIA Heynem.

Penis with a terminal appendix; central and lateral teeth with broad short cusps; marginals small, narrow, and very numerous, with curved cusps; rectum with a caecal diverticulum; prostate not diverging from oviduct; receptacular duct opening into atrium. *L. arborum* Bouch.-Chant.

DISTRIBUTION IN ENGLAND AND ELSEWHERE.

The distribution of *Milax gracilis* in Ireland, so far as it is already known, has been described in the first part of this paper by Mr. R. A. Phillips,¹ to whose researches we owe the discovery of this species, not only at Cork, but also in various other Irish localities. During the few months that have elapsed since I examined Irish specimens which he was good enough to submit to me, I have also seen examples of *M. gracilis* collected in no fewer than six widely separated counties in England and Wales, namely, Sussex, Monmouth, Lancashire, Middlesex, Denbighshire, and Worcestershire.

SUSSEX.—St. Leonards. Among a number of mounted radulæ of British *Milaces*, which the Rev. E. W. Bowell kindly allowed me to examine, I found two which evidently belonged to *Milax gracilis*, although labelled "*gagates*." These, Bowell informed me, were extracted from slugs sent to him with others by Mr. J. R. le B. Tomlin, who had found them in his garden in Boscobel Road, St. Leonards-on-Sea. Through Tomlin's kindness I have since received living specimens of the species, which he collected in his garden in April this year (1930), where it is associated with *M. gagates*, *M. sowerbii*, and other slugs. He tells me that it likes the dampest spots, under heaps of weeds or some thick creeper like *Thymus*, and that he has observed this form ever since he went to St. Leonards in 1921, but mistook it for a variety of *M. gagates*. The specimens are somewhat darker than most of the Irish examples and less tinged with yellow; the pale line along the keel is usually narrower and less conspicuous, and the dark pigment shows less tendency to be concentrated in the dermal grooves; moreover the speckled grey sole is scarcely any darker along the centre than at the edges in the four specimens I have seen. But there can be no doubt whatever that these slugs are conspecific with those found in Ireland.

MONMOUTH.—Chepstow. Prof. A. E. Boycott has kindly sent me specimens of *Milax gracilis* which he collected at Chepstow in July, 1924. He tells me that he found them under a flat stone among nettles in the grounds of the Castle, and that they attracted his attention because they were curled round head to tail like a hairpin and not contracted as slugs usually are when at rest; though he adds that he has since seen *Geomalacus* resting in the same position under a stone at Glengariff.

¹ See p. 71.

LANCASHIRE.—Fallowfield, Manchester. I am indebted to Miss R. Aileen Barr for preserved specimens of *Milax gracilis* collected in May this year (1930) in the garden of Lees Hall, Fallowfield, an eastern suburb of Manchester; and for two living examples found in the following month at the "Oaks," the experimental grounds of the University of Manchester, about half-a-mile from Lees Hall. Miss Barr writes that it is about six years since she first collected this form at Lees Hall, Fallowfield, the locality whence she obtained the specimens on which she based her account of the pedal gland of this species, which she mistook for *M. sowerbii*.¹ She states that the animals were sluggish, and seemed to congregate almost under the soil at the roots of cabbages and tufts of grass, though they were also found in heaps of decaying cabbage leaves and sometimes below stones. The specimens that she kindly sent me are small—like most of the English examples that I have seen—but differ very little from the Irish slugs in colour, the footsole being paler near the edges than along the middle.

MIDDLESEX.—London, W. Quite recently Mr. A. Rodger Waterston has kindly sent me specimens of *Milax gracilis* which he collected in a garden in Esmond Road, Bedford Park, London, W. 4. He tells me that he first noticed this form there when he began collecting Mollusca in 1928, and since then he has frequently seen it in the evenings and especially after rain, when it is common. During the day he has found it amongst the clay of the garden when digging, and sometimes under clinker or boxes where it is damp. He also states that he has seen this slug feeding, not only on fallen rose petals and other decaying vegetation, but also on dead specimens of *Helix aspersa* and *Arion hortensis*. Waterston originally thought that this form was a dark variety of *M. sowerbii*. His specimens vary somewhat in depth of colour: in the darkest examples the pale line along the keel is less conspicuous than in the others, and the sole is very dark grey; but in other specimens the sole is sometimes much paler, and in the slugs from this locality it is not darker along the centre, as in those from Ireland and Lancashire, but in some of the specimens the lateral areas are distinctly darker than the median one, at least towards the hinder end.

DENBIGHSHIRE.—Old Colwyn. I have just received from Prof. Boycott four examples of *Milax gracilis* collected on Sept. 8th, 1930, by Mr. Chas. Oldham, who kindly informs me that he found them on the lower sides of some old boards lying on the grass under apple trees in the garden of a house near the Queen's Hotel at Old Colwyn, on the north coast of Wales. In these specimens the footsole is pale towards the edges, but it is speckled with grey and is some-

what darker along the middle. The only one of these specimens that is full-grown is slightly lighter in colour than the average of those that I have seen from elsewhere.

WORCESTERSHIRE.—Droitwich. Lastly, in November, 1930, while this paper was passing through the Press, I found six moderately large specimens of this species, under some bricks scattered among rough grass and weeds, by the side of Corbett Avenue, Droitwich, associated with *Milax sowerbii*, *Agriolimax agrestis*, *Vitrina pellucida*, *Retinella nitidula*, *Gonyodiscus rotundatus*, *Arion circumscriptus*, *A. hortensis*, *Hygromia hispida*, and *Helix aspersa*. The colouring of these Worcestershire examples of *Milax gracilis* is very similar to that of the Irish specimens; the speckled grey footsole is slightly paler towards the edges than along the middle, and the dorsal mucus is yellow.

From the above account it may be inferred that *Milax gracilis* is widely distributed in Great Britain as well as in Ireland, and it will probably be found in many other counties when collectors become familiar with its distinctive characters. It will be observed that hitherto it has only been found in or near gardens, which suggests that it may owe its distribution partly to human agency. *Milax sowerbii* and certain other British slugs, however, are also most usually found in gardens; and in any case it seems certain that *M. gracilis* should not be regarded as a species recently introduced into the British Isles by man. This is evident from the number of widely separated localities in which it has already been found to occur both in England and Wales and in Ireland, as well as from the fact that it is definitely known to have been present in at least some of these localities for several years, although its identity remained unrecognised by those who found it.

On the Continent Menegazzi depicted seventy-five years ago a slug from Verona, North Italy, which is believed to be this species, although he mistook it for *M. gagates*.¹ About fifteen years afterwards Leydig found the species in Würtemberg, but at first recorded it as a variety of *Milax marginatus* (Drap.).² Later, however he recognised that it was a distinct species, and named it "*Limax gracilis*" in 1876.³ He stated that he had found the slug in damp situations, chiefly in the neighbourhood of the Schlossberg, Spitzberg, and Steinberg, near Tübingen, but that it was far from abundant and he had only collected about twenty specimens in the course of several years. He added that he had also found two specimens in the Botanical Garden at Würzburg, Bavaria, one in October, 1872, and the other in March,

1 Hesse: Abhandl. d. Arch. f. Molluskenkunde, vol. ii, 1926, pp. 112, 139.

2 Jahreshefte d. Ver. f. Naturk. in Würtemberg, vol. xxvii, 1871, p. 218.

3 Arch. f. Naturgesch., vol. xlii (1), p. 276.

1873. More recently Simroth stated that the distribution of *M. gracilis* in Germany extended northwards as far as the Rhön Mountains,¹ nearly fifty miles north of Würzburg; and he and other writers have also recorded its occurrence in several additional localities in the neighbourhood of Verona, Vicenza, and Padua, near the foot of the Alps in North Italy, as well as at Busalla in the Ligurian Apennines.² Before this, however, Babor had collected *M. gracilis* in the neighbourhood of Prague in Bavaria; Hazay had discovered it in Hungary, and named it, in 1881, "*Amalia budapestensis*,"³ having found specimens in the gardens of the Royal Castle, under boulders of freshwater limestone and marl; while Kimakowicz had recorded it from the south of Transylvania in 1884, under the name of "*Amalia cibiniensis*."⁴ Finally the species has also been found, according to Geyer,⁵ in Bulgaria, and, according to Hesse,⁶ in the Crimea.



MAP showing known distribution and probable range of *Milax gracilis* (Leydig).

Thus we see that the known distribution of *Milax gracilis* on the Continent extends from the extreme north of Bavaria in Germany southwards to the Apennines and eastwards to the Black Sea. So far as I am aware this species has not yet been definitely recorded from France; but it is more likely that this is due to its having been

¹ "Deutsche Südpolar-Exped. 1901-1903," vol. xii, Zool. iv, 1910, p. 158.

² Simroth: Abhandl. d. Senckenb. Naturf. Gesellsch., vol. xxxii, 1910, p. 330; Hesse: *op. cit.* p. 139.

³ Malakozool. Blätter, N.F., vol. iii, pp. 8, 37-40.

⁴ Verh. Siebenb. Ver. Naturw., vol. xxxiv, p. 103.

⁵ "Unsere Land- und Süßwasser-Mollusken," 1927, p. 68.

⁶ *Op. cit.*, p. 111.

overlooked or confused with other forms by French collectors than to the species being entirely absent from that country. It therefore seems probable that *M. gracilis* extends over at least as large an area as that indicated by the shading on the accompanying map. The double shading on this map is intended to show the recorded distribution, so far as it is known to the writer.

EXPLANATION OF PLATES.

PLATE I.

OUTWARD APPEARANCE OF LIVING SPECIMENS OF *MILAX*,
NOT QUITE FULLY EXTENDED, $\times 1\frac{3}{4}$.

- Figs. 1—3. *Milax gracilis* (Leydig); Gardiner's Hill, Cork (Dec., 1929).
Figs. 4, 5. *Milax sowerbii* (Fér.); Gardiner's Hill, Cork (Dec., 1929).
Fig. 6. *Milax gagates* (Drap.) var. *plumbea* (Moq.); Ballinasloe, Galway (Jan., 1930).

PLATE II.

ANATOMY OF *MILAX*.

- Fig. 1. *Milax gracilis* (Leydig), Cork. Dorsal view of the pedal gland, and the adjacent part of the pedal artery; $\times 3.5$.
Fig. 2. *Milax gracilis* (Leydig), Cork. Dorsal view of central nervous system; $\times 7$.
Fig. 3. *Milax sowerbii* (Fér.), Cork. Dorsal view of pedal gland, and the adjacent part of the pedal artery; $\times 3.5$.
Fig. 4. *Milax gagates* (Drap.), Thurles, Co. Tipperary. Dorsal view of pedal gland, and the adjacent part of the pedal artery; $\times 3.5$.
Fig. 5. *Milax gracilis* (Leydig), Cork. Ventral view of pallial organs; $\times 3.5$. A=aorta. C=posterior end of cephalic retractor muscle, dividing into the buccal and tentacular retractors. E=posterior end of penial retractor muscle. K=kidney. L=mantle-cavity or lung. P=pericardium. R=rectum. U=ureter. V=ventricle of heart.
Fig. 6. *Milax gagates* (Drap.), Thurles, Co. Tipperary. Head and proximal end of tail of spermatozoon; $\times 1,250$.
Fig. 7. *Milax sowerbii* (Fér.), Cork. Head and proximal part of tail of spermatozoon; $\times 1,250$.
Fig. 8. *Milax gracilis* (Leydig), Cork. Head and proximal part of tail of spermatozoon; $\times 1,250$.
Fig. 9. *Milax gracilis* (Leydig), Ennistymon, Co. Clare. Dorsal view of anterior part of genital organs, showing lengthened epiphallus; $\times 4$.
Fig. 10. *Milax gracilis* (Leydig), Cork. Dorsal view of genital organs, showing shortened form of epiphallus; $\times 4$.
Fig. 11. *Milax gracilis* (Leydig), Cork. Dorsal view of interior of genital atrium, penis, and vagina; $\times 8$.
Fig. 12. *Milax gracilis* (Leydig), Cork. Dorsal view of alimentary canal and salivary glands, with the liver removed to show the course of the intestine; $\times 3$.
Fig. 13. *Milax gracilis* (Leydig), Cork. Front view of jaw; $\times 12.5$.
Fig. 14. *Milax sowerbii* (Fér.), Cork. Dorsal view of anterior part of genital organs; $\times 4$.
Fig. 15. *Milax sowerbii* (Fér.), Cork. Stimulating papilla or sarcobelum from the genital atrium; $\times 4$.
Fig. 16. *Milax gagates* (Drap.), Thurles, Co. Tipperary. Dorsal view of anterior part of genital organs; $\times 4$.
Fig. 17. *Milax gagates* (Drap.), Thurles, Co. Tipperary. Stimulating papilla or sarcobelum from the genital atrium, moderately extended; $\times 4$.

FIELD NOTES ON CEPÆA NEMORALIS Linn. AND CEPÆA HORTENSIS Müller, IN SUSSEX.

By J. GORDON DALGLIESH, F.L.S.

(Read before the Society, September 13th, 1930).

WITHIN easy reach of Brighton is a country lane running N.S. bound on the one side with a steep bank and on the other with grass and tangled herbage. Being in close proximity to the Downs the soil is largely composed of chalk and the flora characteristic, such common plants as *Clematis vitalba*, *Galium verum*, *Scabiosa arvensis*, *Centaurea nigra*, and *Centaurea scabiosa* growing in wild profusion.

Here extending on either side of the lane for about the length of 350 yards are to be found *Cepæa nemoralis* Linn. and *Cepæa hortensis* Müll., both occurring together and being fine and brilliant examples. From a biological point of view this habitat is of the greatest interest, not only on account of the two species intermingling, but because most of the well-known varieties exist here.

The banded form of *nemoralis* 12345 is uncommon, while still more so is 12(345). *Cepæa nemoralis* var. *castanea* and var. *olivacea* are plentiful, being among the commonest of the unicolorous varieties. These varieties from observation would seem to prefer the plants of both Knapweeds (*Centaurea*), being frequently found sheltering during the day among their stems and under the leaves. The variety *rubella* Picard runs into *castanea* Picard, every shade from rose pink to almost red (subvar. *rubra* Baudon) thence into *castanea* have been collected. One of the rarest forms found here is *rubella* 00300, next to it comes var *albofasciata* Picard.

The subvar. *mista* B. & B. is fairly plentiful, *rubella* has if anything a partiality for the leaves of the Coltsfoot, *Tussilago farfara*. That plants upon which *nemoralis* and *hortensis* feed have an influence on the shell has been verified by more than one observer. A. G. Stubbs fed *nemoralis* on the leaves of the horse-radish and obtained strikingly beautiful colour variations.

Very small young of both species have been frequent during August (1930) and eggs obtained towards the end of that month. These as noted by Taylor (Monograph of the Land and Freshwater Mollusca of the British Isles) are "round-oval in shape resembling fowl's eggs in miniature." The movements of the snails are erratic and somewhat disappointing. Copious showers of rain have not always had the desired result of bringing them out in any great quantities within recent years at any rate, although heavy summer rain,

especially after thunder, has been fraught with marked success. During a dry summer it is almost useless to collect, a thorough search of an hour or more having frequently ended in almost negative results. This particular colony has without doubt decreased since 1917. No reason can be assigned for this. That thrushes visit the spot frequently and devour quantities is evident by "thrush stones," and among the broken shells is invariably to be found the one variety most sought after. Here, banded forms are quite as numerous victims as the unicolorous. During 1917 to 1920 both *nemoralis* and *hortensis* occurred in such countless numbers that on an evening in June literally hundreds could have been taken in less than an hour. Probably a severe winter may have deleterious results on land mollusca, for after the severe cold of 1928-29, *Marpessa laminata* Mont. was almost exterminated in some Sussex woods and information of similar happenings in other parts of the country has been noticed.

Among some of the most interesting varieties of this particular colony is an *incarnata* form of *hortensis* with a dark peristome and rib, named by Taylor *nigrolabiata* and this is but a small replica of the *rubella* form of *nemoralis*, scarcely to be distinguished except for size unless an examination of the gypsobelum be made.

Dark-lipped together with white-lipped forms of *hortensis* here are equally numerous, 12345 plus *nigrolabiata* is frequent although (123)(45) plus *nigrolabiata* is rare. The variety *incarnata* shades from light salmon or rosy-pink to orange, sometimes being found with a yellow spire, but *incarnata* with the white peristome and rib has hitherto not been obtained by the present writer anywhere in Sussex. The variety *lutea* Picard, is one of the commonest ooooo forms with white peristome and rib shading off into impure white but not the true *albida* Picard. A very beautiful variety occurs with coloured peristome and rib which would come under the *lutea* group, only to be described as of an "amber colour" for the shell exactly resembles light amber. It has been taken with both white and coloured peristome and rib.

Associated with this particular colony are to be found both *Theba cantiana* Mont., and *Hygromia striolata* Pfeiff. *Helicella virgata* Da Costa is found in considerable numbers, but this is not a true associate, having been traced as a wanderer from the near-by Downs.

It is important from the shell alone of both *nemoralis* and *hortensis* that careful notes on colour should be made from freshly killed material. The storing of specimens for a year or more will show how soon the shells lose their pristine beauty even if kept away from any light, particularly so among the unicolorous varieties. Possibly the shell of *hortensis* is more delicate than *nemoralis*.

In every case where any doubt exists for assigning a given example of either *nemoralis* or *hortensis* to specific rank the gypso-belum should be examined.

Below is appended a list of species and varieties obtained since 1917 up to the present year 1930.

Cepæa nemoralis Linn.

BANDED.

12345

1(23)45

(123)(45)

(12345)

||(345)

::345

COLOUR VARIATIONS.

albolabris Dum. & Mort.

(=*libellula* ooooo=*leucostoma*
Pirone).

rubella Picard.

rubella 00300

subvar. *mista* B. & B.

libellula Risso.

libellula 00300

fascialba Picard.

olivacea Risso.

castanea Picard

subvar. *petiveria* Moq-Tan.

studeria Moq-Tan.

Cepæa hortensis Müller.

BANDED.

12345

10345

123(45)

(123)(45) + *fuscolabiata* Kreglin-
ger.

1(23)(45)

(12345)

||(345)

::345

COLOUR VARIATIONS, ETC.

trochoidea Clessin.

ludoviciana Moq-Tan. (= *tenuis*)

subvar. *subalbida* Locard.

lutea Picard.

lutea + *fuscolabiata* Martens.

sub. var. *lutescens* Schmidt.

incarnata Picard + *nigrolabiata*
Tay.

incarnata 12345 + *nigrolabiata*

subvar. *colorata* Dum. & Mort.

+ *nigrolabiata*.

baudonia Moq-Tan.

lilacina Taylor

olivacea Taylor

undulata Taylor

rufozonata Cockerell

arenicola Macgillivray

subvar. *lurida* Moq-Tan.

fuscolabiata Martens

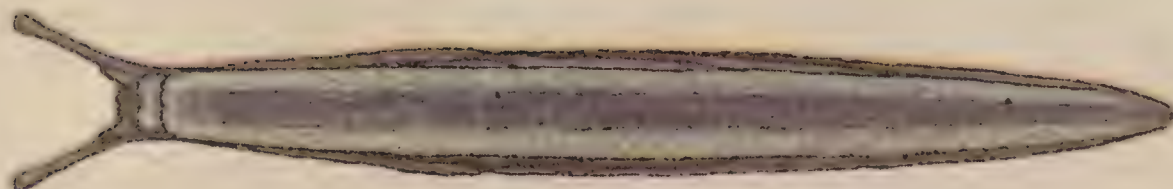
roseolabiata Taylor

mons. *sinistrorsum* Taylor

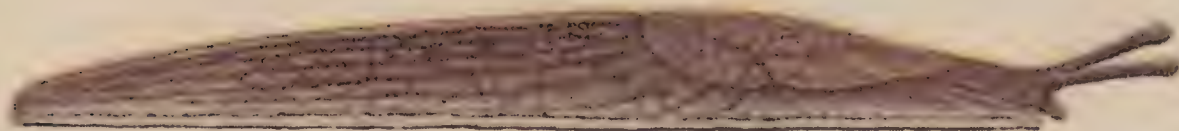
fuscolabiata ooooo



1



2



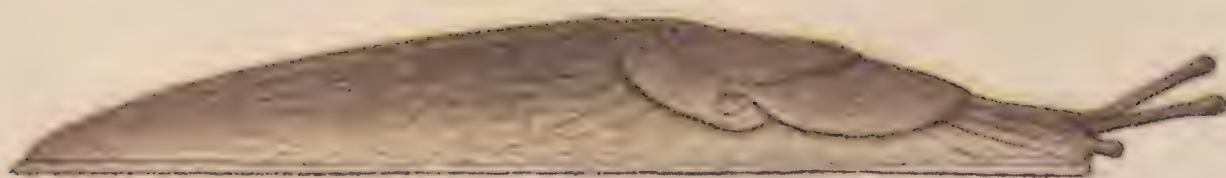
3



4



5



6

Figs. 1—3. *Milax gracilis* (Leydig), Cork (Dec., 1929).

Figs. 4, 5. *Milax sowerbii* (Fér.), Cork (Dec., 1929).

Fig. 6. *Milax gagates* (Drap.) var. *plumbea* (Moq.), Ballinasloe, Galway, (Jan., 1930).



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MARCH, 1931.

No. 4.

HIBERNATION OF *HELIX ASPERSA* Müller.

BY DR. W. D. LANG, F.R.S.

(Read before the Society, March 4th, 1931).

ON Saturday, 18th October, 1930, about a hundred specimens of *H. aspersa* were pulled out of a root-hole in a fallen tree in Ware Dean, Arundel Park.

A large number were this year's snails, huddled together for overwintering, but most were snails of former years, which had died in their winter quarters.

The Arundel Park *Helix aspersa* are larger than the average, and many by the gradual suffusion of the banding present a more or less "selfed" appearance on the last whorl, and some by a complete suffusion and disappearance of the banding are completely "selfed."

After rejecting a few as too weathered for determination I quickly sorted the remainder into three groups—normally banded, partially "selfed" and totally "selfed"; the proportions were 24 : 47 : 23.

The boundaries of the categories were necessarily vague and the sorting quickly done. But as former experiences had yielded the same proportions, I thought it worth while to put them on record.

One specimen of the hundred or so—a "selfed" individual—was sinistral.



THE DISTRIBUTION OF NON-MARINE MOLLUSCA THROUGHOUT CONTINENTAL AFRICA.

By M. CONNOLLY.

(Presidential Address, read before the Society, October 18th, 1930).

A GREAT deal has been written on this subject, in varying degree, by the Americans, Pilsbry and Bequaert, and the French savants Morelet, Bourguignat, Germain and Pallary, but hardly anything by an English author, which is the more remarkable, considering that we are by far the largest land-holders in the Dark Continent.

I have studied this fauna for more than a quarter of a century, and my views on it are set forth independently of those of other writers, and may not be in complete agreement with all of them.

Africa is unique among the Earth's continents, in that it stretches right through the tropics from a point well north to a point well south of them, for the northern extremity, Cap Blanc, near Biserta in Tunis, is about 900 miles, one and a half times the length of Great Britain, north of the tropic of Cancer, while Cape Agulhas, in the Cape Province of South Africa, is more than 700 miles south of that of Capricorn. It is easily understandable, therefore, that there is ample scope for every variety of climate and environment, and this is indeed the case, ranging from the more or less arid deserts of the Kalahari and Sahara to the tropical rain forests, such as those of the Belgian Congo and Victoria Falls. Added to this, and probably due to the situation of those deserts, the lines of demarcation between certain Molluscan centres are amazingly well defined, in some cases hardly a genus or species occurring in one region, though abundant in that adjoining it.

For my own part, I would apportion the continent, more particularly in regard to terrestrial mollusca, into five main provinces, with the possible inclusion therein of two sub-provinces; these would be:

- (i) NORTH-WEST AFRICA; Morocco, Algeria, Tunis and probably Tripoli.
- (ii) THE SUDAN, including Egypt and the sub-province of Somali-land.
- (iii) ABYSSINIA.
- (iv) CENTRAL AFRICA.
- (v) SOUTH AFRICA, with the sub-province, formerly in German possession, of South-West Africa.

(i) The molluscan fauna of North-West Africa is almost entirely palæarctic and has been vastly over-elaborated by Bourguignat and

further so by Morelet, Pallary and others ; unfortunately Bourguignat devoted the greater part of his mischievous activity to certain districts of Africa, and caused, wherever he intruded, almost inextricable chaos (not only by the creation of masses of redundant species, but also of long lists of *nomina nuda*) which will necessitate infinite research ere it can be completely rectified.

The Helicidæ of the North-West-African province comprise at least 200 so-called species of *Archelix* (olim *Otala*, *Marmorana*, etc.), twice that number of *Helicella* (olim *Xerophila*) *sensu lato*, with a fair sprinkling of *Albea* Pallary (*Leucochroa* Auct.) and other palæarctic genera of little import to this review.

The Zonitidæ are practically confined to *Polita*, the Enidæ to *Ena* and *Napæus*, the Stenogyridæ to *Ferussacia* and *Rumina* and the land operculates to *Pomatias* and *Ericia*, while the Clausiliidæ and Pupillidæ both include one or two European forms. I ought perhaps to mention that *H. aspersa* Müll. is common, while *E. pisana* Müll. and *C. barbara* Linn. are present along the entire coast from Mogador to Alexandria.

Among the aquatic gastropoda there are such well known species as *Lymnæa stagnalis* and *palustris*, while all the genera are common to Europe with the exception of *Melanoides* Oliv., which, although widely diffused in Africa and the East, does not appear to be recorded this side of the Mediterranean ; on the other hand, the European genus *Melanopsis* is represented by a host of species, though how many of these are due to fertile imagination is open to question.

The Pelecypoda are wholly palæarctic, mainly consisting of *Unio*, *Margaritana* and *Pisidium*, but none are yet recorded from Tripoli.

In summing up the mollusca of North-West Africa, I would stress, in addition to the points already mentioned, the *absence* of such eastern and southern genera as *Eremina* (save for a single record from East Tunis), *Chondrula*, *Zootecus* and the operculate *Ligatella* from the terrestrial, and of *Pila*, *Lanistes*, *Viviparus*, *Cleopatra*, *Corbicula*, etc. from the fluviatile fauna, points of particular interest in view of their occurrence so short a distance eastward.

The molluscan fauna of Tripoli is either very scanty or has been very scantily collected, since it only appears to comprise, up-to-date, 57 terrestrial and 10 aquatic species. The only noteworthy feature about the latter is the apparent absence of *Melanopsis*, which, however, cannot be said to be established on such scanty particulars ; the majority of the former consists of *Helicella* (*Xerophila*), which throws but little light on relative geographical distribution, but *Eremina*, (three species) *Levantina* and *Chondrula* (one species of each) make their début and cast an eastern glow over the molluscan horizon.

(ii) However, when we reach Egypt, which I would include as the north-eastern district of the Sudanese province, we find a sudden, almost complete change in the more prominent genera and the beginning of the Ethiopian, as opposed to Palæarctic, fauna. Of the land molluscs, *Helicella* is fairly well distributed, but the huge *Archelix* group has only a single representative in the circum-Mediterranean *vermiculata* Müll., which is said to have been introduced from Greece, and *Albea* but three, all confined to the cultivated region near the north coast, their place being taken elsewhere by *Eremina*, which is present in Arabia, but is only known otherwise west of Tunis in the extraordinary occurrence of *E. duroi* (Hidalgo) in Rio de Oro, on the western coast of the Spanish Sahara, one of the facts which seem to warrant the grouping of Egypt and the entire Sudan in the same district.

Chondrula, *Pupoides*, *Zootecus* and *Opeas* (one species) are present, but *Polita*, *Ena*, *Napæus*, *Clausilia*, *Ferussacia*, and nearly all the smaller Pupillidæ, as well as all land operculates, are absent, although *Chondrula*, *Polita*, the *Enidæ* and *Clausilia* are present in Syria and the last mentioned genus in Sennaar.

The aquatic mollusca, too, show enormous change; the Lymnæidæ, Planorbidæ, Ancyridæ, and *Melanoides tuberculata* show little variety in their occurrence over nearly the entire continent, and will receive but scant notice hereinafter, but from the Operculates *Melanopsis* is missing, a remarkable feature, seeing that it recurs abundantly in Palestine, Syria, Cyprus, etc., and that it is represented by at least one fossil species, *M. ægyptiaca* Blanckenhorn, in the Plio-Pleistocene beds of the Lower Nile Valley. On the other hand, *Pila*, *Lanistes*, *Viviparus* and *Cleopatra* appear for the first time, as do *Cælatura*, *Mutela*, *Aspatharia*, *Corbicula*, *Sphærium*, *Eupera* and *Etheria* of the Pelecypoda, *Cælatura* and *Corbicula* being extremely common. It is easy to attribute this sudden alteration in the facies of the aquatic fauna to Nilotic influence, but it does seem strange that the comparatively narrow expanse of the Libyan desert (varying from 250 to 600 miles in breadth) should form so effectual a barrier between the Palæarctic and Ethiopian systems.

(iii) Before proceeding further with my Sudanese province, it will be convenient to deal with that of Abyssinia, since it is situate in the middle of the former and has little in common with it, or indeed any other, being almost entirely specialised.

In a recent paper¹ I explained this phenomenon by the fact that Abyssinia is a tropical country with a temperate climate, consisting in the interior of elevated plateaux, attaining an altitude of 8,000 feet,

¹ P.Z.S., 1928, p. 182.

well supplied with lakes and rivers and bounded by a wall of steep mountains, which shut it off on nearly every side from the arid low-lying lands around it.

Hence it is not surprising that it marks the southern limit of such Northern Genera as *Helicella*, *Fruticicola*, *Agriolimax*, etc., and the Northern limit of such tropical genera as *Ledoulxia*, *Gudeella*, *Achatina*, *Homorus*, *Subulina*, the Streptaxidæ and Pachnodidæ; it is also naturally a favourite haunt of the European *Vitrina*, which has a particular fancy for the mountainous regions of Central Africa.

Although 218 so-called species of terrestrial and 102 of aquatic mollusca have been recorded from Abyssinia, only twelve of the former, exclusive of *Limicolaria*, are known to exist elsewhere, and even though well over a third of the remainder are probably redundant, the balance furnishes abundant proof of the richness and exclusiveness of this fauna.

(ii *cont.*) Resuming consideration of the Sudanese province, it is divided by Abyssinia into an eastern and a western section, which show marked discrepancy between their faunas. On the east, south of Eritrea, which has some connection with Abyssinia, it comprises the Somali-lands, French, British and Italian, for the most part semi-desert, presenting several features of exclusive interest more or less in common, especially to the last two, though perhaps the apparent homogeneity is over-emphasised by the fact that no really experienced collector has yet explored them at the right season and in the right way to unearth the minute or more delicate forms.

Streptaxidæ, Helicarionidæ, Vitrinidæ and Pupillidæ are extremely uncommon, though the Zonitoid genus *Bloyetia* Bgt. has its headquarters in the Italian territory, where *Ledoulxia* also occurs; and the Pachnodidæ are well represented by *Rachis* and *Cerastus*. There is, too, a strong Arabian flavouring, as might be expected from the similarity of the countries, the Enid genus *Euryptyxis* Fischer, with its broadly reflected lip, and the operculate *Georgia* Bgt. being fairly frequent on both sides of the Arabian Sea, while it seems probable that a species named *maunoiriana* Bgt. may be identical with *Zebrina albata* Fér. and prove the existence of that genus in Africa.

Achatina is present in Italian Somaliland and *Limicolaria* there attains its only footing near the east coast.

West of the Abyssinian divide, much of the Somali element is lost—no *Bloyetia*, *Georgia* nor *Euryptyxis*, and the entire fauna undergoes a gradual modification from that of Egypt until it merges, a little above the northern frontiers of Kenya and Uganda, into that of the

huge zoological province of Central Africa, which extends across the continent from the Atlantic to the Indian Ocean, and from the Sudan to the River Zambesi.

(iv) Here at once we encounter a molluscan fauna, unsurpassed in richness, though not in beauty, in any part of the globe. To deal with it in systematic order, the first and most numerous group is the great family of Streptaxidæ, for the most part carnivorous, residing under stones and decaying vegetation, though occasionally of arboreal habit, and remarkable for the bright and varied colouring of the animal, which may be either red, yellow, or green, without this feature being, apparently, of even sectional significance, although the green colouring has been found strong enough to dye the water in which the animals have been immersed. The genus *Ptychotrema* Mörch is peculiar to Africa, but the relationship of other genera to those of the East and of South America awaits anatomical examination ere it can be determined.

The Zonitidæ and Helicarionidæ abound, the beautifully sculptured and often quaintly shaped *Trochozonites* Pfeffer being, perhaps, the most interesting member; on the other hand, *Helicarion* (*sensu lato*) and the small Zonitoid *Gudeella* Preston are most difficult of determination, as with rare exceptions they can only be identified by an anatomist, or perhaps less satisfactorily by the examination of their microscopic sculpture under high magnification, while far too many species have been described, often from long deceased shells in such poor condition that the colour is faded, the microscopic sculpture invisible and the animal, of course, absent.

There is a fair sprinkling of forms related to the Helicidæ, as represented by *Halolimnohelix* Germain, to which Pilsbry, on anatomical grounds, and Preston, on shell characters alone, have added other genera, Preston's having been ascribed by him to the Zonitidæ, and there is a large assortment of the Pachnodidæ, a Family recently separated by Odhner from the Enidæ, comprising the genera *Pachnodus*, *Conulinus*, *Rachis*, *Rhachidina* and *Rhachistia*, of which all, except *Pachnodus* (pace Pilsbry) occur in this province. Their habitat resembles that of the Streptaxidæ, in that while most of the species are almost subterranean, others, differing but little from them in outward appearance, prefer to live up trees, usually under loose bark, often coating their shell with its dust as camouflage from birds and other enemies in their exposed position.

Pupillidæ are rather poorly represented, most of the Central African forms appearing to be inseparable from those of South Africa and Abyssinia, and only two species of *Clausilia* are known. The family

Stenogyridæ, however, with its subfamilies Achatininae and Stenogyrinae, attains its most conspicuous stage of development in the gigantic *Achatina* and almost equally conspicuous *Limicolaria*, which contribute some of the largest land shells known to science. They are, of course, peculiar to Africa, except that *A. panthera* and *fulica* are now colonised in the Mascarene Is., India and Ceylon, in the last named island *fulica* being an absolute pest in gardens and plantations, where it is by no means unusual for a child to collect from three to four thousand for slaughter on a favourable morning. It is an interesting fact, in this connection, that there is no limestone in Ceylon, which is of almost purely granitic formation, and due doubtless to this cause the snails have developed a passion for whitewash, for which they crawl up the walls of buildings in order to lap it off the whitened windows, and this is now turned to account in keeping down the pest by placing little bags of poisoned whitewash in spots where they are likely to find and eat it.

An interesting point regarding the African distribution of the two genera is that while *Limicolaria* extends northward into the Sudan and Abyssinia, it does not occur in South Africa or near the east coast south of Somaliland, whereas *Achatina* does not extend so far north, but abounds from coast to coast the whole way southward to Port Elizabeth.

I cannot pass over this group without special mention of the beautiful genera *Pseudachatina*, *Pseudotrochus*, *Perideriopsis* and *Callistoplepa*, which are practically confined to the west coast; but on coming to the smaller members of the family, with the exception of *Homorus*, *Petriola* and *Pseudoglessula*, which are occasionally attractive, there is but a plethora of *Subulina*, *Opeas*, *Pseudopeas*, *Curvella*, *Nothapalus* and other comparatively small forms, distributed impartially over the entire region, and necessitating the use of a high-powered microscope even to allot them to the correct genus.

The land operculates are practically confined to *Ligatella* (olim *Cyclostoma* or *Tropidophora*, from which it appears separable) and *Maizania*, a genus of the Cyclophoridae, the former being absent from the extreme west coast and the latter poorly represented on the east, but both are present in south Africa.

The more we learn about the distribution of genera, and even species, in this vast area, the more certain it becomes that several have a very wide range, and that many which have long been considered extremely localised, or perhaps differentiated by reason of apparent geographical isolation, are spread, even in most unexpected instances, over a very wide area. Thus, the common theory that species

described from the west coast may not be expected to be found far inland, is negatived by such varied forms as *Trochozonites adansoniae* Morelet, *Prositala fernandopoensis* Germain, *Gudeella consueta* Preston, *Limicolaria zebra* Pilsbry (= *turbinata* Rve.) and the operculate *M. intermedia* Mts., which extend by diverse routes into Uganda and some even into Kenya Colony, and another bubble to be pricked is the idea that the great Rift Valley, which is said to extend from Lake Nyasa to Palestine, forms any kind of obstacle to lateral dispersion of the mollusca, since, so far as I have observed, most species skip it with ease.

The aquatic fauna, with one outstanding exception, is monotonously Nilotic. An infinity of redundant species have been created by innumerable authors, several without figuration, on details too trivial to merit even varietal rank, while the ineffable Bourguignat has obtruded as usual to divide, in one instance, according to Smith, into no fewer than 3 genera and 33 so-called species a single monotypic genus.

However, it may be accepted that the entire Nilotic fauna is distributed generically throughout the whole extent of tropical Africa, as are many individual species. The Pulmonates are purely Nilotic, except that *Physopsis* Krauss does not appear to exist in lower Egypt; but they are complicated by the existence of far too many invalid species, and the misidentification, and consequently erroneous records, of several valid ones.

With regard to the Operculata, the eastern side of the continent has little of interest to exhibit, except *Eussoia* Preston, described as an inoperculate *Assimineia*, a theory confuted by Pilsbry, and the extraordinary *Afrocanidia mihi*, resembling the Eastern genus *Canidea*.

On the western side, in addition to a few localised paucispecific genera, such as *Pachymelania* Smith, *Potamides* Brongn., *Pseudogibbula* Dautz. and *Sierraia* Conn., the genus *Potadoma* Swains., easily distinguishable from *Melanoides* by reason of its thick, heavy shell, comprises many interesting, albeit difficult species, and extends from the west coast as far inland as Uganda, where it is also known in fossil condition, while one species has recently been recorded from the Sudan.

The Pelecypoda are also of Nilotic character, although a few distinct genera and subgenera have been proposed in both Unionidæ and Cyrenidæ, but in my own point of view, almost the most remarkable feature is the wide distribution except on the west coast of the small *Corbicula africana* (Krs.) (= *radiata* Phil. pre-oc.) from Egypt to Natal, whereas the larger *C. consobrina* (Caill.) is practically unknown south of the Sudan.

The outstanding exception to Nilotic monotony is, of course, Lake Tanganyika, wherein occurs a fauna for the most part only faintly resembling that of other parts of the globe.

As is well known to all, it includes many genera and species entirely unique, whose close resemblance to marine shells has gained for them the names of Thalassoid and Halolimnic. Considering that Tanganyika is but one of the chain of great Central African lakes, and was at one time, probably, more closely connected with some of them, this uniqueness is certainly extraordinary, but Germain¹ has pointed out that this is almost entirely a Melanian fauna, and that to the east, in Lake Nyasa, is also found a Melanian fauna, far less peculiar than that of Tanganyika, but distinct, nevertheless, from any which is known to occur elsewhere, while in the west, in the streams and pools of the Belgian Congo, exists yet another Melanian fauna, rich in strange little local forms, which differ materially from those of Nilotic type.

Hence it would appear that, from some cause that I will not attempt to explain, there extends almost across the continent, at about the latitudes of Lake Tanganyika, a peculiar Melanian fauna, varying enormously in different localities, but constant in its own variation from those to its north or south.

(v) Coming to my last province, South Africa, while the Kunene River, on the west, seems to form an inexplicable, but insuperable barrier between the land shells of Angola to the north and S.W. Africa to the south, the mighty Zambesi has little or no effect in restricting the distribution of those to the east, and the transition from central to southern forms is very gradual till about the Tropic of Capricorn, below which the typically South African fauna may be said to prevail.

The main features of this, as compared to that of the tropics, are the absence of *Limicolaria*, *Ledoulxia*, *Homorus*, *Pseudopeas*, *Vitrina*, *Pseudoglessula* (but for a solitary record in Zululand), and, except for a single species of *Gonaxis*, all of the Streptaxidæ but *Gulella*, which is widely diffused over the eastern and central districts, but fades away on the west. On the other hand, of the tropical genera, *Achatina* is abundant and so are many of the Helicarionidæ, but much comparative analysis is necessary ere the true relationship can be established between Godwin-Austen's South African genera and those of further north. *Opeas* and *Curvella* abound, but only one species of the imperforate *Subulina*, recently collected in the Northern Transvaal, occurs, its place being taken by the perforate *Euonyma* M. & P.

There are, however, many genera and even sub-families peculiar to this sub-continent. The huge agnathous cannibal, *Natalina caffra* (Fér.), which an early collector used to find feeding on the corpses of Zulus, killed in one of their tribal fights, is the type of a genus which includes other subgenera, nonexistent apparently elsewhere; the Endodontidæ are represented by *Afrodonta* M. & P. and *Trachycystis* Pilsb., a useful dumping ground for many species of dubious attribution, which was established for the Cape Town *Helix bisculpta* Bs., so must in any case represent purely South African forms, as must the beautiful Pupilloid *Fauxulus* Schauf., which is restricted to districts near the south coast, though I have collected it as far inland as Majuba.

Of the Operculata, *Maizania* is rare and *Ligatella* very common, and *Chondrocyclus*, remarkable in some species for its vase-shaped operculum, appears peculiar to South Africa.

In the west of the Cape province, however, there appears a far more remarkable series of novelties; the sub-family Dorcasiinæ of the Acavidæ, which includes *Trigonephrus* Pilsb. and *Dorcasia* Gray, and the genus *Phortion* Prest. (olim *Phasis* Albers), are practically restricted to the Cape province and S.W. Africa, but the district last mentioned merits, in my opinion, a sub-division of its own. There do not appear to be any convincing reasons for the extreme exclusiveness of its small molluscan fauna from that of the surrounding regions, since the boundaries are purely geographical and can hardly exercise any influence whatever on the distribution, but, as I pointed out in a recent paper,¹ although only 44 species of land shells are yet recorded from this large area, no fewer than 26 are peculiar to it, while the Helicoid genus *Sculptaria* and the Zootecoid *Xerocerastus* are almost entirely confined within its limits.

The aquatic mollusca differ little in facies from those of further north, though *Lanistes* is so far unknown south of the Zambesi, and *Viviparus*, *Cleopatra* and a few others are infrequent. All the small bivalves are present, while the genus *Cafferia* Simpson has been created, on very dubious grounds, for *Unio caffer* Krs., and the Indian *Indonaia* Prashad has been verified by its author and Haas as occurring in at least four so-called species in the Sub-continent.

This review would hardly be complete without allusion to the Bilharzia disease, which has become so prevalent during the last fifteen years over many parts of Africa and other continents, and is closely connected with malacology. It is caused by a trematode worm, which passes its larval existence within the liver or food-gland of certain freshwater mollusca, whence it enters the human body from

water, taken either internally, through drinking, or externally, through bathing, in any of the pools or streams where its molluscan hosts are to be found. A point of interest is that, wherever possible, the *human* parasite (for the disease attacks other animals besides man) selects as hosts members of the *red*-blooded family Planorbidæ, for preference the large, open mouthed Genus *Physopsis*, and only in its absence, as a rule, members of other genera, such as *Planorbis pfeifferi* in South Africa, *Plan. alexandrinus* and *Bulinus truncatus* in Egypt and *Plan. dufouri* in Portugal.

I have omitted from this rather superficial survey any mention of the adjacent islands of the Indian and Atlantic oceans, since in spite of their proximity, their molluscan faunas not only differ almost *in toto* from that of the Dark Continent, but from one another, presenting in each group of islands such extreme individuality that their consideration would alone furnish material for an even longer address than that which it has just been my privilege to deliver.

Nassarius fenestratus Marrat.—It has always been a matter of surprise that this common Indo-Pacific species apparently had to wait till 1877 before anyone took pity on it and gave it a name. I have recently been examining the types of this genus (formerly *Nassa*) that were described by Arthur Adams in the Proc. Zool. Soc. London 1851, pp. 94-114, 92 in number, and recognise those of *gemmulifera* (two in number) as small examples of the species we always are accustomed to call *fenestrata*.—J. R. le B. TOMLIN.

Arion ater v. oculata.—This beautiful creamy white slug with black tentacles and orange foot I found at Thorne, August 16th, 1930. It was sent to Mr. C. Oldham for confirmation.—ELSIE M. MOREHOUSE (*Read before the Society*, Dec. 3rd, 1930).

OBITUARY NOTICE: PROF. DR. W. POLIŃSKI.

BY J. R. LE B. TOMLIN.

(Read before the Society, March 4th, 1931).

WLADYSŁAW POLIŃSKI was born at Warsaw, on June 22, 1885. His father was Alexander Polinski, a well-known historian and musical critic.

At the Jagiellonian University of Krakow he studied Natural History, Zoology and Comparative Anatomy, and in 1911 he received the degree of D.Ph. and was appointed assistant at the Institute of Comparative Anatomy.

When war broke out he was appointed Second Lieutenant in the Polish Legion under Marshal Pilsudski, took part in several battles in 1914 and 1915, and earned the decoration *Za Wierną Służbę*—For Faithful Service. But he was not a strong man, and the hardships of campaigning brought on serious heart trouble which eventually caused his premature death when almost 45. He left the army in 1918 and was appointed Keeper of Invertebrates at the Polish Museum of Zoology at Warsaw. In 1929 he succeeded Dr. Anton J. Wagner as Director of the Museum, and was also appointed Professor of Zoology at the High School of Agriculture in Warsaw. But this promise of increasing scientific activity was very soon cut short, and he died after a very brief illness, on June 2nd, 1930.

Several important investigations in which he was engaged at the time of his death remain, unfortunately, incomplete, especially his studies on the Zoogeography of the Carpathians, and those on the Gastropod Fauna of Lake Ochrida in Jugoslavia. Poliński was a member of the Physiographical and of the Geographical Commission of the Polish Academy of Science at Krakow, a Fellow of the Polish Society of Zoologists and Anatomists, and a Fellow of the Polish Entomological Society.

For most of the above information I am indebted to Dr. T. Jaczewski, Keeper in Entomology at the Warsaw Museum, and I should like warmly to acknowledge his assistance and his courtesy.

Poliński wrote on many subjects, from Cetacea to Isopoda, Odonata and Orthoptera. In Mollusca he published a good many papers on local faunas, both recent and fossil. His study of *Clausilia cravenensis* Taylor in this Journal, vol. xviii, p. 256, will be readily recalled. I quote below some of his most important publications which relate to the Mollusca either specifically or inferentially.

- 1913.—Recent Problems of Ecological Zoogeography.
- 1914.—Quaternary Mollusca from the Clays of Ludwinów. Bull. Int. Ac. Sci. Krakow, 1914.
- 1917.—Two new Subspecies of *Unio crassus* Retz. Spraw. Tow. Nauk. Warsaw, x.
- 1917.—Materials for a Malacological Survey of Poland, Lithuania and Polesia. Prac. Tow. Nauk. Warsaw, No. 27.
- 1919.—Geographical Distribution of the Helicidæ in Poland. Przegląd Geogr. Warsaw, vol. 1.
- 1921.—Notes on a Zoological Trip to the Kujawy Lakes. Pamietnik Fizjogr. Warsaw, xxvi.
- 1921.—New Clausilias from Peru. Bull. Int. Ac. Sci. Krakow, 1921.
- 1922.—South American Clausilias in the Polish Museum. Ann. Zool. Mus. Pol. i, 1922.
- 1922.—Anatomy and Systematics of the Polish Xerophilas. Ibid.
- 1924.—Contributions to the Systematic and Zoogeographic Study of Albania. Ann. Zool. Mus. Pol. iii.
- 1924.—Studies of the Polish Helicidæ. Bull. Int. Ac. Sci. Krakow, 1924.
- 1924.—New S. American Clausilias. Ibid.
- 1927.—The Circulatory System of *Succinea oblonga*. Pamietnik Zjazdu Anat. Zool., Warsaw, 1927.
- 1927.—The Geographical Importance of Mollusca in Poland. Ochr. Przyr. Krakow, vii.
- 1928.—On *Pirotoma dubia cravenensis* Taylor, J. of C. xviii.
- 1928.—Problems of the Alpine and Carpathian Fauna, illustrated by a detailed study of the Perforatella group of Helicidæ. Ann. Mus. Zool. Pol. vii.
- 1929.—Importance of the Carpathians in European Zoogeography. Pamietnik ii, Zjazdu Geogr. Krakow.
- 1929.—Arterial Circulatory System of the Pulmonata. Tenth International Congress of Zoology at Budapest.
- 1929.—Faune Reliquaire des Gastéropodes du lac d' Ochrida. Glas. Srp. Kral. Ak. Nauk. Beograd, cxxxvii.
- 1929.—Introduction to Faunistics.
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OBITUARY NOTICE: JOHN BRAZIER.

BY TOM IREDALE.

(Read before the Society, November 8th, 1930).

INASMUCH as John Brazier was elected a member of the Conchological Society in November, 1879 (Journ. Conch. vol. II, p. 368, Dec. 1879) it is meet that his death so many years afterwards should be recorded in this Journal, especially as his membership lapsed so many years ago.

Born at Sydney, Australia, on Sept. 23rd, 1842, he only passed away in the same city on Aug. 20th, 1930, at the great age of 87. One of the greatest shell-collectors that has ever lived, as most of his activities were before our lifetimes, this fact is not so well known as it deserves. It may suffice to recall that Angas listed the Marine Mollusca in 1867 totalling 408 species; Brazier immediately began sending additional species so that only ten years later Angas published a second Supplement raising the total to 693, an extraordinary addition in such a short period. His fame as a shell-collector gained him the honour of accompanying Julius Brencley on the cruise of H.M.S. Curaçoa through the South Sea Islands, and later he was selected by Sir William Macleay as conchologist for the expedition of the Chevert along the coasts of Queensland and the islands of Torres Straits. A huge collection was made and Brazier began cataloguing the Mollusca but only listed the Gastropods to the number of nearly 700 species, when, for some reason now quite unknown, the rest were left unlisted. He contributed a few articles to this Journal about the same time. In 1880 he was appointed to the Australian Museum but suffered under a retrenchment scheme in 1893 and since then has done little conchological work. From 1869-1898 he published in various periodicals well over 100 papers, and was a member of many societies. He was one of the original members of the Linnean Society of New South Wales, and was the last of that number to pass away. He was also elected Corresponding Member of the Zoological Society of London as long ago as 1869. Owing to his many conchological discoveries his name will always remain prominent in Australian conchological history, many species being named in his honour by Angas, while there is a genus *Brazieria*, and many records of New South Wales Mollusca still stand to his credit, some after fifty years research. He presented many choice specimens to the Cabinet of the Conchological Society, some in recent years.



OBITUARY NOTICE: MARCHESE DI MONTEROSATO.

BY THE REV. DR. A. H. COOKE.

It would give me pleasure to be allowed to supplement in one particular point Mr. Tomlin's very interesting memoir (J. of C., xix, 37) of the Marchese di Monterosato and that is, his extreme generosity towards brother conchologists. I had the privilege of visiting him at Palermo, I think in 1913, and soon found how dangerous it was to express admiration of any particular species or varieties in his collection. Without saying a word to me at the time, he packed them up and sent them to my hotel. Fortunately I was able to make him some small return, for he happened just then to be keen on large exotic Cypræidæ and I sent him a good series of *Cypræa exanthema* and others from Panama. Later on, knowing that I was interested in the genus, he sent me a series of the Clausilias of Sicily, some of which were of his own naming.

Raeta abercrombiei Melvill.—This beautiful species was described among the novelties collected by Alexander Abercrombie at Bombay between 1888 and 1892. Melvill published two papers on these gatherings in the "Memoirs and Proceedings of the Manchester Literary and Philosophical Society," series 4, vol. vii, the first containing an account of the source of the collections and a systematic catalogue of the bulk of the material, while the novelties (twenty-five in number) were all described and figured in the second paper, *R. abercrombiei* occurring on page 64, plate i, fig. 25. Melvill there mentions its near alliance to *R. grayi*¹ H. Adams from Borneo; probably he had not seen an actual specimen of this latter at the time, but a comparison of the holotypes of these two *Raetas* demonstrates their absolute identity. I am also able to record the species from Aden, on the strength of a specimen which I possess from the Jousseau collection. Whilst on the subject of these two Bombay papers it may be worth while to point out that in the "References to Plate" on page 67 the numbers 4 and 6 are interchanged, fig. 4 in reality representing *Ricinula xuthedra* and fig. 6 *R. subnodulosa*, as may be seen by referring to pp. 54 and 55.—J. R. le B. TOMLIN.

¹ Proc. Zool. Soc. 1872, p. 13, pl. iii, f. 23.

OBITUARY NOTICE : B. B. WOODWARD.

By A. S. KENNARD, A.L.S.

(Read before the Society, December 3rd, 1930).

BERNARD BARHAM WOODWARD, F.L.S., F.G.S., F.R.M.S., was born in St. John's Wood, London, 3rd August, 1853. He was the only son of Bernard Bolingbroke Woodward, Librarian of the Royal Library, Windsor Castle and was thus grandson of Samuel Woodward the Norwich geologist and nephew of S. P. Woodward the well-known author of the "Manual of Mollusca," and of Dr. Henry Woodward, F.R.S., Keeper of the Geological Department of the British Museum.

He was educated at Merchant Taylors' and University College Schools and after a short service in Messrs. Robarts, Lubbock and Co's bank, became Curator of the Geological Society in 1873 and was responsible for the removal of the Society's Collections from Somerset House to Burlington House and their rearrangement on the new premises. He entered the Printed Book Department of the British Museum in September, 1876 and on October 13th, 1881, was placed in charge of the General Library in the New Natural History Museum.

He retired 21st July, 1920 and was further retained till 1922, to carry on the work of the Library Catalogue. He was twice married, his second wife dying in 1904, but leaves no children. He died on October 27th, 1930. With such an ancestry it is not surprising that he formed a small collection of shells when he was ten years old and during his long life Malacology was his favourite study, although at one time he was a keen geological student. His first contribution was on the Pleistocene Mollusca of the Barnwell Gravels in 1888 (Proc. Geol. Assoc., vol. x, pp. 355-360) and marked a new era in the study of the borderland where Geology and Zoology meet. From then to the end he was the author or joint author of many papers in the Annals and Magazine of Natural History and in the publications of many learned societies dealing with many aspects of Malacology. He was recorder of the Molluscan portion of the Zoological Record from 1893-1896 and the articles on the Non-Marine Mollusca in the Victoria County Histories are from his pen.

He was also a contributor to the Dictionary of National Biography. He was author of "The Life of the Mollusca" London, 1913, a work which deserves the high commendation it has received,

the "Catalogue of the British species of *Pisidium*" 1913, and joint author of "The Synonymy of the British non-marine Mollusca" 1926. As Librarian of the Natural History Museum, he was responsible for the formation of the unequalled library and his "Catalogue of the Books, Manuscripts, Maps and Drawings in the British Museum (Natural History)" 5 volumes, 1903-1915 and supplement 1922, will always remain as a memorial to his knowledge and painstaking accuracy. His knowledge was always at the service of all students and his loss is mourned by a large circle of friends.

***Amphipeplea glutinosa* (Müll.) in East Kent.**—The original British locality for this shell was Deal (Montagu "*Test. Brit.*" p. 380). It seems to have died out there, though E. H. Solly collected it as late as 1900. It may be of interest to note that at present (1930) this species is living in a few ditches in Chislet Marshes, at a spot about $2\frac{1}{2}$ miles from the sea. In a direct line this is 12 miles from Deal. The intervening land is all low-lying and largely marshy. The two loci would appear to have been colonised from a common centre. Chislet marshes were under the sea well within historical times.—J. E. COOPER (*Read before the Society*, Sept. 13th, 1930).

ENA MONTANA AT LACKHAM.

By A. E. BOYCOTT.

(Read before the Society, November 8th, 1930).

GEORGE MONTAGU says (*Testacea britannica* 1803 p. 395) of his *Helix lackhamensis* "we first found it in a moist wood at Lackham in Wiltshire, in one small spot only, adhering to the trunks of ash and hornbeam trees." He gives no date but he was born at Lackham House in 1755 and married and in the army on foreign service before he was twenty so that we may reasonably surmise that he made his discovery fully 160 years ago. I paid a fruitless visit in 1923 under unsuitable weather conditions and it was with some emotion that at a second trial on 26 Sept., 1930, I found a fine *Ena montana* sitting on an ash tree in what was evidently Montagu's wood. Lackham House is between 2 and 3 miles south of Chippenham on the road to Melksham, and about a mile north of Lacock. The wood in the grounds is a flat oak wood which no one would suspect of being of much conchological interest: the locus for *montana* is the hanging wood opposite the house, across the river Avon and the derelict canal, labelled "Tacklemore Wood" in the 6-inch map and I found *montana* immediately below "Ash Hill Farm." It is essentially an ash wood with hazel undergrowth: there are some oaks, a few beeches, some patches of planted firs and a good deal of sycamore. There is no hornbeam now. There may have been in Montagu's time and large trees existing in 1770 would probably have died some time ago. But it is possible that Montagu was mistaken in his identification: hornbeam is probably not native in the west of England and Aubrey in 1685 said specifically that there was none in Wilts (M. Christy *Jour. Ecology*, 1925 vol. xii p. 55). The ground is mostly thick with *Mercurialis* and there are patches of garlic. The wood lies on the edge of the lower greensand and there are many wet places and springs, some with tufaceous deposits. The earth is sandy, in parts highly calcareous with *Cyclostoma elegans* (which Montagu p. 343 found here) while in other places it gave no fizzle when tested with acid. No attempt was made at a complete collection of the mollusca. *A. arbustorum*, *H. rufescens*, *Cl. laminata* and *Cl. rugosa* were abundant and *H. aspersa*, *H. nemoralis*, *H. hispida*, *H. rotundata*, *Hy. nitidula* and *C. lubrica* were noticed. I also found *H. fusca* which Montagu does not note as occurring at Lackham though he described it as a

new species, found by himself only "in a wood in Devonshire" (p. 425). On the other hand he found *E. obscura* (p. 392) which I specially looked for and could not see: it is I believe even rarer to find *E. montana* without *E. obscura* than to take *Cl. laminata* without *Cl. rugosa*.



DESCRIPTION OF A NEW SPECIES OF ALCADIA.

By J. DAVY DEAN, F.E.S.,
Of the Department of Zoology, National Museum of Wales.

(Read before the Society, November 8th, 1930).

Alcadia erythrozona sp. nov.

SHELL small, globose, thin, spire slightly depressed, whorls $3\frac{1}{2}$, convex, covered with somewhat irregular lines of growth, surface pitted with extremely minute punctures, striation or lines of growth deeper towards the suture which is moderately depressed; mouth elliptical, slightly compressed above, outer lip expanded and thickened above, rounded below, somewhat sinuous, interrupted at the base of the notch or slit immediately below the base of the columella; umbilicus closed, umbilical area thickened; colour pale amber, banded at the suture and base of the last whorl by deep red-brown, outer lip and base of shell around the umbilicus yellow; operculum horny, slightly notched below. Alt. 5 mm., diam. max. 8 mm.



Locality: Claremont, St. Ann, Jamaica: coll. G.A. Martin. Type and paratypes in National Museum of Wales.

This small but very distinct form cannot be identified with any of the species described by C. B. Adams, and Mr. J. R. le B. Tomlin, who has very kindly examined the species, considers it to be new. *Alcadia erythrozona* (ἐρυθρος—red) has for its small size a very conspicuous “hare-lip,” the characteristic feature of the genus, and in this respect alone is very distinct from *adamsiana* Pfr., and *depressa* Gray, the nearest species to it in point of size. The colour is also very distinctive and this is uniform throughout the series collected. The species, like others inhabiting Jamaica, favours the depressions in the honey-comb limestone.

EDITORIAL NOTES.

The Bureau of Science of the Philippine Government has published a "Summary of Philippine Land Shells" in connexion with vol. 42 of the Philippine Journal of Science (1930). It is in the form of a systematic catalogue of 114 pages with literary references and perhaps its most useful feature is that it gives exact geographical information as to the island or islands on which each species occurs. No notice is taken of the numerous names applied racially or varietally in recent years. The compiler is Mr. L. A. Faustino.

We should like to call attention to Dr. Thiele's extraordinarily useful Handbuch der Systematischen Weichtierkunde, pt. i, 1929, a volume of 376 pp. and 470 good text illustrations, and admirable in its clear and well-spaced printing. The first part deals with the Chitons and the Prosobranch Gastropods; pt. ii will deal with the remainder of the Gastropods; pt. iii with the Scaphopods, Lamellibranchs and Cephalopods; pt. iv will conclude the work with a general and comparative survey. In a short preface the author says that for various reasons he is obliged to exclude any consideration of fossil forms, so that the Handbuch will not altogether supersede Fischer's Manuel. But as regards recent Mollusca the information is most comprehensive, well-arranged and up-to-date, and Dr. Thiele's treatment of the inordinate flood of new genera strikes one as eminently rational, moderate and practical. After 22 pages on the Classis Loricata the rest of the part is devoted to the Prosobranchia which are divided into three orders, as follows:

Ordo I. Archæogastropoda which includes Pleurotomariidæ, Haliotidæ, Fissurellidæ, Trochidæ, Helicinidæ and others.

Ordo II. Mesogastropoda includes the rest of the land and freshwater operculates, the Aglossa, Calyptræacea, Strombidæ, Heteropoda, Naticidæ, Cypræidæ, Tonnidæ, Cymatiidæ and allies.

Ordo III. Stenoglossa includes Muricidæ, Buccinidæ, Olividæ, Volutidæ and the Toxoglossa.

The index is the one thing wanted to make this invaluable mass of information more quickly accessible.

The Natural History and Variation of the Pointed Snail, *Cochlicella acuta*. By D. Aubertin, A. E. Ellis and G. C. Robson. Proc. Zool. Soc., London, 1930, pp. 1027-1055, pl. i (January 1931).

This paper gives the results of the study of 6500 snails, over half of which were obtained from localities in Sussex. The authors have given an interesting account of the species and have achieved a successful study of variation in the Sussex colonies, concluding with a discussion on melanism. It is a paper that should be read carefully, it is not sufficient merely to see the summary, for in addition to results definitely established, there is much that is suggestive and valuable throughout the paper. R.W.

Kurze Bemerkungen zur Kenntniss der Schalenstruktur und Systematik der Loricaten. By J. R. M. Bergenhayn. K. Svenska Vet. Akad. Handlingar, vol. 9, no. 3 (1930), 54 pp., 10 pl.

This paper is an important contribution to our knowledge of Chitons. It opens with a detailed account of the structure, microstructure and tectonics of the shell of *Tonicella marmorea* (Fab.), and the homologues of the shell parts in other mollusca. The shell structure of twenty-nine groups is then discussed,

and the paper concludes with a discussion of phylogeny and a systematic list of families and genera. The arrangement differs in several respects from that of Thiele (1909 and slightly modified 1929), but in most cases good reason seems to be given for changes.

R.W.

Gabb's California Cretaceous and Tertiary Type Lamellibranchs. By R. B. Stewart. Acad. Nat. Sci. Phila., Special Publ. No. 3 (August 1930), 314 pp., 17 pl.

Mr. Stewart's work is well-known to palæontologists and fully appreciated by them; but this particular book will be valuable to recent conchologists in that the author has had to survey the nomenclature of a great many lamellibranch groups in some detail. Rather apologetically he has inserted a chapter ix on nomenclature: no apology is needed, for it is a valuable review of type designations and should be helpful to many. He draws attention to the type designations in Anton's Verzeichniss der Conchylien 1839 (? 1838), which curiously have been consistently overlooked: the book has been perhaps rejected as privately printed, but there can be no doubt that it was published and on sale (the price is given by Engelmann). Systematic workers on Lamellibranchs will find that Mr. Stewart has prepared the ground thoroughly for them in a great many groups.

R.W.

A series of Monographs has been appearing for some time entitled: "Die Fauna Südwest—Australiens," edited by Professors Michaelsen and Hartmeyer. Last year appeared two parts dealing with the Mollusca; Lieferung 8 by Dr. Thiele, on the Gastropods and Lamellibranchs contains a large number of new species, mainly from Sharks Bay; Lieferung 9 by Dr. Hoffmann, is a short part entitled: "Unbeschalte Gastropoda Pulmonata," containing only 4 species—*Limax flavus*, *Agriolimax laevis*, *Milax gagates* being three of them.

We regret to record the death of another conchologist, well-known to some as an indefatigable correspondent—Dr. Alfred Oberwimmer of Vienna. Born in 1875, he began to study and collect the local Mollusca while still a boy, and in the course of a very busy life as a practising physician he built up a collection of about 17,000 species, partly by exchange and partly by extensive collecting tours on foot in Central and Eastern Europe. He died on Nov. 30th last. He was not a great writer and his two chief papers were on the Heteropoda and Pteropoda of the Pola expedition and on the Mollusca of an expedition to Samoa, New Guinea and the Solomon Isles.

A question has arisen as to the exact date of publication of Monterosato's *Nomenclatura Generica e Specifica*, and I am much indebted to Mr. Winckworth for notes which confirm my own conclusions. It is not mentioned in the Zool. Record till 1900, under Supplemental Titles. The title-page is dated 1884, and enquiry in Palermo failed to elicit more exact information. It is possible, however, by careful comparison with the dated parts of the *Mollusques Marins du Roussillon* to arrive at the probable month of issue. Thus Monterosato quotes the subgenus *Massotia* which was published in fasc. 7 of the above work in August 1884, and *Rissoa micrometrica* from page 310 which appeared in Sept. 1884. This work first mentions the *Nomenclatura* on p. 346 (Feby. 1885); Fischer's Manuel first quotes it in the part published on Jan. 29, 1885. This confirms the date 1884 on the title and from the above data it must have appeared *post* September, in the last quarter

of the year. Moreover all Monterosato's papers in vol. III. of the *Naturalista Siciliano* antedate the *Nomenclatura*: in vol. IV. the paper on p. 21 can only be said to be contemporaneous with the *Nomenclatura*, that on p. 60 is probably later, those on pp. 80 and 200 are definitely later.

Planorbis corneus in Ulster.—This species is very local in Ireland, mainly in shallow drains in Co. Kildare, and the N.E. corner of Queen's County; or, as Stelfox puts it in his Irish List, 1911, "is confined to a small part of the country drained by the Rivers Barrow and Liffey, where it was first discovered about 1815 by Capt. Brown. Here it lives in shallow drains and swampy pools," . . . "Its habitats appear to be intermediate between those which completely dry up and those such as canals, in which the water-level seldom varies." The finest specimens I have ever seen in any museum or other collection were given me years ago by Dr. R. F. Scharff, M.R.I.A., who collected them in a drain near Monasterevan, Co. Kildare. I found them in many drains there in later years but never as large as Dr. Scharff's fine specimens, one of which he stated was the largest Irish specimen he had ever seen. The late Mr. Chas. E. Wright, an old member of our Society, sent me from St. Neots, Hunts., a few specimens, one almost as large as the fine specimen referred to. Miss Nora Fisher, a young member of the Belfast Naturalists' Field Club, a very keen conchologist, has last May found in a small lily pond in the grounds of a Co. Antrim Hotel, many fine specimens of this species. This is the first record for the Province of Ulster (see Irish Naturalists' Journal, July, 1930) though it is of course, as she states possibly a case of accidental introduction with water lilies, a parallel case with the late Mr. W. F. de V. Kane's find in 1900 in a lily pond at Markree Castle, Sligo (*Irish Naturalist*, x, 131). There it was probably, Colonel Cooper thought, introduced with plants of *Stratiotes aloides*, or, with *Limnæa pereger* also introduced, to keep down duckweed. The two ponds in which it occurs at the Hotel are quite isolated, and no streams or drains near at hand suitable for it in any way. The Sligo habitat is different, the lily pond there drains into the Unshin River and there are many quite suitable habitats for it to multiply in, quite close at hand. In one of the Co. Antrim habitat ponds it is associated with *Limnæa pereger*, which is not present so far (August) in the smaller lily pond in which Miss Fisher first found it. Mr. Chas. Oldham has a note on the fecundity of the species in the *Naturalist*, 1930, p. 177, and the very large number of young specimens in the Hotel smaller pond this autumn seems to prove the correctness of his views. It may be spreading into canals in the Barrow and Liffey area as Mr. J. H. Halbert, M.R.I.A., found it in the Royal Canal in the city of Dublin, some years ago.—R. J. WELCH (*Read before the Society*, Sept. 13th, 1930).

A sinistral *Helix hortensis* near Brighton.—On July 30th I took a living, full-grown, sinistral specimen of *H. hortensis* var. *incarnata* and *fuscolabris* at West Blatchington, near Brighton. The variety of *H. nemoralis* and *H. hortensis* in the lane at the above locality is extraordinary.—ARTHUR G. STUBBS (*Read before the Society*, Sept. 13th, 1930).

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN & IRELAND

584th Meeting, held at the Manchester Museum, September 13th, 1930.

Mr. G. C. Spence in the chair.

Candidates Proposed for Membership.

Dr. Leo P. Rusnov, Vienna, Austria, VIII, Auerspergstrasse 9 (introduced by H. Schlesch and W. T. Elliott).

Mrs. Edith C. Elliott, Mardos Road, Payneham, South Australia (introduced by Mrs. E. M. Morehouse and J. W. Jackson).

Lothar Forcart, Ph.D., St. Jacobstrasse 6, Basel, Switzerland (introduced by H. Schlesch and W. T. Elliott).

Dr. Caesar R. Boettger, Scharnhorstrasse 23, Berlin, N. 65 (introduced by B. B. Woodward and A. S. Kennard).

N. Wright, 16, Craguish Avenue, Norbury, London, S.W.16 (introduced by A. S. Kennard and J. W. Jackson).

Miss Nora Fisher, Inisglas, Greenisland, Belfast (introduced by R. J. Welch and J. W. Jackson).

Resignations.

C. Horton-Smith.

J. W. Hainsworth.

Papers Read.

"*Milax gracilis* (Leydig) in the British Isles," by R. A. Phillips and H. Watson.

"Field Notes on *Cepæa nemoralis* (L.), and *Cepæa hortensis* (Müll.), in Sussex," by J. Gordon Dalglish.

Amphipeplea glutinosa (Müll.) in East Kent,' by J. E. Cooper.

"*Planorbis corneus* (L.) in Ulster," by R. J. Welch.

"A sinistral *Helix hortensis* (Müll.) near Brighton," by A. G. Stubbs.

Exhibits.

By Mr. A. K. Lawson: *Limnæa palustris* v. *albida* from Southport, Lancs.

By Mr. G. C. Spence: Newly-described or re-discovered Urocoptids.

By Mr. C. H. Moore: Series of British and Foreign *Viviparus*.

By Mr. L. E. Adams: *Epiphragmophora patasensis* Pfr. and *Odontostomus dædalus* Desh., from Mar Checita, Argentina; *Paludestrina parchappii* Orb., from River Carcaraña, Prov. Sta. Fé.

585th (Annual) Meeting, held at University College, Gower St., London, W.C., October 18th, 1930.

The President (Major M. Connolly) in the chair.

Amongst those present were the following: Messrs. J. Gordon Dalglish, R. Garnett, G. C. Spence, A. S. Kennard, J. V. Dacie, H. Beeston, C. H. Dedman, A. K. Lawson, George Shrubsole, S. G. Finch, A. M. Wall, E. A. Chapman, A. Blok, A. E. Salisbury, H. C. Fulton, A. P. Gardiner, G. L. Wilkins, A. Wrigley, R. Winckworth, and L. R. Cox, Rev. H. E. J. Biggs, Drs. A. E. Boycott, C. Price-Jones, and J. W. Jackson, Lt.-Col. A. J. Peile, Miss K. M. White, Miss J. D. Robertson, Mrs. E. M. Morehouse, and Prof. A. Morley Davies.

Appointment of Scrutineers.

Dr. C. Price-Jones and Mr. H. Beeston were appointed Scrutineers.

Appointment of Auditors.

Messrs. C. H. Moore and F. Taylor were appointed Auditors.

Election of Trustee.

Mr. B. R. Lucas was elected Trustee in place of Dr. J. Cosmo Melvill (deceased).

New Members Elected.

Dr. L. P. Rusnov.	Mrs. E. C. Elliott.	Dr. L. Forcart.
Dr. C. R. Boettger.	Mr. N. Wright.	Miss Nora Fisher.

Candidates Proposed for Membership.

Dr. W. Küenzi, Naturhistorisches Museum, Bern (introduced by Major Connolly and G. C. Spence).

Rev. H. E. J. Biggs, North View, Chadwick Road, London S.E. 15 (introduced by A. S. Kennard and G. L. Wilkins).

Resignation.

The Hon. Lionel Lindsay.

Presidential Address.

The President delivered an address on "The Distribution of Non-Marine Mollusca throughout Continental Africa," and a cordial vote of thanks was passed unanimously.

Votes of thanks were also accorded to the Authorities of University College, London and of the Manchester Museum, for the use of rooms for meetings of the Society.

Election of Officers and Council.

The Officers and Council for 1930-31 were unanimously elected as nominated (see page 65).

Exhibits.

By A. K. Lawson: *Arinia sowerbyi* Pfeiffer (*Cyclostoma minus* Sowerby) from Cebú.

By R. A. Todd: Abnormal *H. striolata*; *Cochlicella barbara* from a hedge-bank at Aldbourne, Wilts., five miles north-east of Marlborough and 50 miles from the sea.

By R. J. Welch: Abnormal form of *Paludestrina jenkinsi* from Drogheda.

By G. C. Spence: Recently described Cuban Urocoptidæ.

By J. V. Dacie: Sinistral *Viviparus contectus* Millet from Kessingland, Suffolk.

By S. G. Finch: Living *Achatina fulica* Fér.

By A. E. Boycott: *Ena montana* from Tacklemore Wood at Lackham, Wilts., 26th Sept., 1930; this is the wood in which Montagu first found the species about 1780, describing it as *Helix lackhamensis*.

By C. Diver, F. M. Turner and A. E. Boycott: Various abnormal forms of *Limnæa peregra* obtained in the course of artificial breeding. There is some tendency for scalariformity to be inherited, but otherwise all the young obtained from these monsters were normal in shape.

By A. J. Peile: Some large radulæ from African L. & F. W. Mollusca.

By C. Price-Jones: *Clausilia bidens* L. from Shelley's grave at Rome: *Pomatias elegans* from Keats' grave at Rome, and two species from Ostia.

By Miss J. D. Robertson: A specimen of *Helix pomatia* weighing 1 oz. 37 grains Troy; a caddy-spoon made from shell of *Harpa*, and snuff-boxes made from *Mytilus edulis* L., *Cypræa argus* L. and *C. tigris* L.

By E. Chapman and Dr. Morley Davies : *Pteria phalænacea* (Lam.) from the Miocene-Burdigalian (coll. M. Davies); "Mystery Shells" (coll. Chapman) identical with the fossils except that they are recent shells and contain pearls.

By R. Winckworth : British and Indian Bivalves, illustrating special habitats and commensalism; examples of similar faunas from similar habitats :

Natica-Mactra assemblage. Sandy shore.

(a) Tropical. Chandipur, India.

(b) Subtropical. Port Said, Egypt.

(c) Temperate. Rye, England.

By G. L. Wilkins : Dissections of drift-wood containing shells and burrows of *Teredo navalis* L.; specimens and photographs illustrating ravages of *Teredo navalis* in marine structure at Walton-on-Naze; Recent and Fossil *Pholas* from beach and cliffs, Walton-on-Naze; photographs and specimens from layer of *Pectunculus* and *Mactra*, Red Crag, Walton; Recent and Fossil *Gastrochæna dubia*, *in situ*: Lignite bored by *Pholas parva* and *P. dactylus* v. *decurtata* from Brighton; selection of *Saxicava rugosa* from Brighton, Dawlish and Walton-on-Naze; *in situ* in Chalk and Mudstone.

By A. P. Gardiner and Miss K. M. White : *Barnea candida* (L.) and *Pholas dactylus* L. from submerged forest at Amroth, Pemb.; *Onchidella celtica* (Cuv.) from Trevone, N. Cornwall, with natural surroundings; *Craspedochilus cinereus* (L.) and *Callochiton lævis* (Mont.) from Marazion, to show protective colouration; two Ascidians, *Clathurella purpurea* (Mont.) and var. *philberti* Mich., *Turbonilla lactea* (L.) from under stones at Marazion; *Mod. modiolus* (L.) from Tenby with the following parasites—*Hydroides norvegica*, *Serpula vermicularis*, *Pinnotheres pisum*, *Scrupocellaria reptans*, *Obelia geniculata* and *Plumularia setacea*; *Crepidula*, *Calyptræa* and *Crasp. cinereus in situ* from Ryde; *Barbatia lactea*, *Gephyrea* sp., *Idothea* sp. *Onoba striata*, *Kellia suborbicularis*, all obtained by splitting rocks at Marazion; typical associations of plants and molluscs from pools at Lizard Downs, Cornwall; *Spatangus purpureus* and its commensals, *Tellinmya ferruginosa* (Mont.), *Montacuta bidentata* (Mont.) and *Harmothoe* sp. from the *Zostera* zone at Salcombe; burrow of large *Gebia deltura* with *Lepton squamosum* Mont., *Synapta*, *Lepidasthenia* and *Phascolosoma pellucidum* (Mont.); and other very interesting exhibits.

ANNUAL REPORT.

THE present is the Fifty-Fourth Annual Report of the Society. During the last twelve months the Society has lost two members by death, seven by resignation, and one has been struck off the list of members under Rule IV. Fifteen new members have been elected, including six at this meeting. The present membership is 250, including the five Honorary Members.

The losses sustained by death are—George W. Young, a member since 1927, and James Cosmo Melvill, a member since 1880, a former President and Trustee of the Society. An obituary of the latter appeared in the Journal for July, 1930, together with a list of his molluscan papers.

The usual monthly meetings have been held at the Manchester Museum by the continued kind permission of the Authorities.

Twenty-four papers and notes have been read at the meetings and several have since appeared in the pages of the Journal.

The Special Exhibits have been: Tanganyika shells, *Opisthostoma*, *Melania*, *Haliotis*, *Ampullaria* and *Cochlostyla*.

Three numbers of the Journal have been published since the last Annual Meeting, viz. : vol. 18, no. 12, December, 1929, ; vol. 19, no. 1, April, 1930 ; and vol. 19, no. 2, July, 1930, comprising 92 pages of text and five text-figures. The December number contained the Index to vol. 18, and the April number a revised List of Members.

In June last the University of Leeds conferred the honorary degree of Master of Science on Mr. Henry Crowther, one of our Honorary Members and one of the Founders of the Society. He was for several years Curator of the Museum of the Leeds Philosophical and Literary Society.

In December last the Rev. E. H. Nash, Vicar of Wetley Rocks, Staffs., a member of the Society since 1911, celebrated the Jubilee of his ordination.

Additions to the Library have been received from Messrs. M. Connolly, H. H. Bloomer, G. C. Spence, Hugh Watson, C. Oldham, S. Hirase, H. Schlesch, F. Okland, W. B. Marshall, H. B. Baker, W. J. Clench, Lt.-Col. W. H. Turton, Drs. J. W. Jackson, H. A. Pilsbry, C. M. Steenberg, Miss Tera van Benthem Jutting and Miss A. L. Massy.

Gifts to the Cabinet have been made by Mr. Hans Schlesch.

RECORDER'S REPORT (Non-Marine Mollusca).

SINCE the last report (vol. xviii, p. 299) 83 new records have been added to the Census. Most notable is the discovery by R. A. Todd of *Cochlicella barbara* on a remote grassy bank between two ploughed fields at Aldbourne (Wilts., N), 5 miles N.E. of Marlborough, about 50 miles from the sea and some 60 miles from the nearest known localities at Burnham in Somerset and on the Dorset coast. The species lives in the middle of Ireland but this is the first record of a definitely inland locus in Britain.

The differentiation of *Milax gracilis* makes it necessary to re-examine the distribution of what has been called "*sowerbyi*." Collectors are therefore asked to send to the Recorder any specimens of *Milax* they may be able to obtain.

Wilts. N. (7) :—*Cochlicella barbara* (R. A. Todd) ; *Ena montana* (on ash in Tacklemore Wood near Lackham, Montagu's original locality, A. E. Boycott).

Dorset (9) :—*Pisidium pulchellum* (C. Oldham).

Isle of Wight (10) :—*Hyalinia lucida* (garden, G. C. C. Damant), *Paludestrina ventrosa* (L. E. Adams).

Sussex E. (14) :—*Ashfordia granulata* (G. Shrubsole).

Essex N. (19) :—*Hyalinia alliaria*, *Helicella caperata caperata*, *H. heripensis* (C. Oldham).

Norfolk W. (28) :—*Phytia myosotis* (C. Oldham).

Cardigan (46) :—*Vertigo pygmaea*, *V. substriata* (J. H. Salter).

Montgomery (47) :—The record of *M. sowerbyi* (vol. xvii, p. 123) is a mistake for *gagates*.

Cheshire (58) :—*Ashfordia granulata* (Chester), *Ceciloides acicula* (G. Shrubsole).

Yorks N.W. (65) :—*Pisidium subtruncatum* (G. Fysher).

Durham (66) :—*Helicella caperata caperata*, *Succinea elegans* (D. K. Kevan).

Northumberland S. (67) :—*Milax gagates* (garden), *Hyalinia lucida* (garden), *Paludestrina jenkinsi* (E. P. Blackburn).

Kirkcudbright (73):—*Paludestrina stagnalis* (D. K. Kevan).

Wigtown (74):—*Hyalinia rogersi* (J. V. Dacie).

Ayr (75):—*Paludestrina stagnalis* (D. K. Kevan).

Lanark (77):—*Pisidium hibernicum*, *P. milium*, *P. nitidum*, *P. subtruncatum* (D. K. Kevan).

Peebles (78):—*Hyalinia rogersi* (R. Waterston), *Hy. pura*, *Succinea elegans*, *Planorbis albus*, *Pl. nautilus*, *Pl. leucostoma*, *Sphærium corneum*, *Pisidium nitidum* (D. K. Kevan).

Berwick (81):—*Hyalinia radiatula* (D. K. Kevan).

Haddington (82):—*Helicella caperata caperata*, *H. heripensis* (Canty Bay), *Hygromia striolata* (? wild), *Vallonia excentrica*, *Phytia myosotis*, *Bythinia tentaculata*, *Paludestrina stagnalis*, *Pisidium milium*, *P. personatum* (D. K. Kevan).

Edinburgh (83):—*Hygromia striolata* (gardens), *Vallonia pulchella*, *V. excentrica*, *Pisidium milium*, *P. obtusale* (D. K. Kevan), *Hyalinia lucida*, *Helicella caperata caperata*, *Vallonia costata* (R. Waterston, who has also confirmed the old record of *Truncatellina cylindrica* (*Sphyradium minutissimum*) on Arthur's Seat.)

Linlithgow (84):—*Limnæa truncatula*, *Paludestrina stagnalis* (D. K. Kevan), *Valvata piscinalis* (R. Waterston).

Stirling (86):—*Planorbis vortex*, *Valvata cristata* (D. K. Kevan).

Kincardine (91):—*Vertigo substriata* (R. Waterston).

Main Argyle (98):—*Planorbis nautilus* (R. Waterston).

Dumbarton (99):—*Physa fontinalis* (D. K. Kevan).

Cantire (101):—*Zonitoides nitidus*, *Acanthinula aculeata*, *Vertigo substriata*, *Succinea elegans*, *Limnæa palustris*, *Planorbis albus*, *Pl. nautilus*, *Pl. contortus*, *Valvata piscinalis*, *Paludestrina stagnalis*, *Sphærium corneum*, *Pisidium casertanum*, *P. hibernicum*, *P. lilljeborgi*, *P. milium*, *P. nitidum*, *P. obtusale*, *P. personatum*, *P. subtruncatum* (D. K. Kevan).

Wexford (127):—*Helicella caperata caperata* (C. Oldham).

Clare (141):—*Vallonia excentrica* (J. C. Dacie).

Kerry N. (148 N.):—*Vallonia excentrica* (J. C. Dacie).

For the sake of uniformity the nomenclature of the last issue of the Census (1921; vol. xvi, p. 165) is used. Thus *Succinea elegans* above is what Ellis calls *pfeifferi*.

YORKSHIRE CONCHOLOGICAL SOCIETY.

Report of the Leeds Branch of the Conchological Society of Great Britain and Ireland.

The year has been a very successful one as regards interesting and enthusiastic meetings although membership has shown a decline and now stands at 36. I regret to report the death of two of our Yorkshire members—Mr. J. E. Crowther of Elland, a prominent Yorkshire naturalist, and Mr. F. Fierke of Hull.

The Officers are as follows: *President*: Mrs. E. M. Morehouse, *Vice Presidents*: Dr. H. C. Versey, Mr. H. J. Armstrong, *Council*: Mr. T. Coote, Miss K. Morehouse, Mr. W. Gyngell, Miss E. Dufty, and past Presidents. *Hon Sec*: Mr. J. R. Dibb, *Hon. Treas. and Recorder*: Mr. H. J. Armstrong.

Meetings have been held on Saturday afternoons as follows :—Jan. 11th, Short Papers by Members and Exhibits. Feb. 8th, Presidential Address by Mrs. Morehouse on “Molluscs and their food,” a paper full of valuable information which was enthusiastically received. March 8th, Lecture by Mr. J. Musham entitled : “Notes on the Life of *Limnæa glabra* Müll.” April 12th, Mr. Fred Taylor of Oldham gave a Display of Non-Marine Shells and recounted some Collecting Reminiscences. The meeting was very well attended. During the summer four excursions were arranged and held as follows :—May 31st Reynards Ings, Addingham. Unfortunately our leader Mr. F. Rhodes was unable to be present and Mr. Greevz Fysher kindly took his place. June 14th, The River Foss, York. Here again our leader Mr. H. Sowden was seriously ill, and Mr. Arthur Smith of York, took the leadership—The day was brilliant but Molluscs were somewhat sparse. The river was worked up to New Earswick, where the party was entertained to tea by the kindness of Dr. Gayner. This meeting was a joint one with the Y.N.U. Conchological Section and the York Field Naturalists Club and was well attended. July 12th, led by Messrs. North and Lumb. The canal between Halifax and Salterhebble was visited in conjunction with the Y.N.U. Conchological Section and the Halifax Scientific Society. The afternoon was fine and warm and we were rewarded with a fair “bag” of the common fresh water species. Sept. 23rd, Mr. H. J. Armstrong conducted a party to Bramham Cross Roads, near Leeds. The object of this excursion was to obtain series of the varieties of *Helix nemoralis* and *H. hortensis*. The afternoon was very wet and few members attended. Those who turned up, however, were well rewarded for the locality is a remarkable one for these land shells. For the Winter Session three meetings were arranged, two of which are yet to take place. At the October Meeting there was to have been a lecture by Mr. F. W. Fierke. The meeting was, therefore, devoted to general exhibits and notes.

As regards field work in Yorkshire the results during 1930 have been rather poor and the impression is given that land and freshwater snails have not been very abundant.

JOHN DIBB (*Hon. Sec.*)

ANNUAL REPORT OF THE LONDON BRANCH.

I am glad to report that the Session has been quite successful, nine meetings having been held with a good attendance at each. The December meeting was somewhat marred by the announcement of the death of Mr. Geo. W. Young, F.G.S., a keen supporter of the Branch. A vote of condolence with the relatives was passed, and conveyed in a letter sent by the Hon. Sec. on behalf of the Members. Exhibits were plentiful at the meetings throughout the Session and short notes describing them have been read. Field Meetings were held in May and July to Wanstead Park and Forty Hill, Enfield, respectively. A total of 25 species of Land and Freshwater Mollusca was yielded by Wanstead Park, but Forty Hill did not prove so successful. Through the influence of the Rev. H. E. J. Biggs, the members were allowed access to the grounds of Mr. E. A. Bowles, F.L.S. and the adjacent woods belonging to Sir H. F. Bowles, where a total of about 15 species was collected, including *Planorbis complanatus* from a stream flowing through the woods. Although the decease of one member and the resignation of another have depleted our ranks, two new members have recently joined so that our membership is still maintained.—

GUY L. WILKINS, *Hon. Sec.*

**586th Meeting, held at Leeds in conjunction with the Leeds Branch,
November 8th, 1930.**

Mrs. E. M. Morehouse (President of the Leeds Branch) in the Chair.

New Members Elected.

Dr. W. Küenzi. Rev. H. E. J. Biggs.

Candidates Proposed for Membership.

John R. Dibb, F.E.S., 45, King George Avenue, Chapel Allerton, Leeds (introduced by Mrs. Morehouse and Dr. J. W. Jackson).

Dr. Joseph Baldacchino, Ph.C., M.D., 3, Sa. Molino, Casal Curmi, Malta (introduced by Giuseppe Despott and Dr. J. W. Jackson).

Members Deceased.

B. B. Woodward. F. W. Fierke.

Papers Read.

"*Ena montana* at Lackham," by Dr. A. E. Boycott, F.R.S.

"Description of a new species of *Alcadia* from Jamaica," by J. D. Dean,

"Obituary: John Brazier," by Tom Iredale.

Exhibits.

By Mr. J. D. Dean:—*Alcadia erythrozona* sp.n. from Claremont, St. Ann, Jamaica (coll. G. A. Martin).

By Mr. H. Sowden:—A number of abnormal land and freshwater shells collected near York.

By Mr. T. W. Saunders:—A number of Carbonicolas from Bentley Colliery (five feet above Barnsley seam).

By Mr. F. Taylor:—A large series of Non-Marine shells collected at Brighton.

By Mrs. Morehouse:—Shell-trumpets from Madagascar and a number of shell-necklaces.

Lantern Lecture.

The Hon. Secretary, Dr. J. Wilfrid Jackson, gave a lecture on "Some British Snails and their Habitats," illustrated by lantern slides.

587th Meeting, held at the Manchester Museum, December 3rd, 1930.

Mr. G. C. Spence in the chair.

New Members Elected.

J. R. Dibb. Dr. Joseph Baldacchino.

Member Deceased.

J. E. Crowther.

Papers Read.

"Obituary: B. B. Woodward," by A. S. Kennard, A.L.S.

"*Arion ater* v. *oculata* at Thorne," by Mrs. Morehouse.

"Abnormal Land and Freshwater Shells found near York," by H. Sowden.

Exhibits.

By Mr. J. F. Musham:—Incomplete copy of Martyn's "Universal Conchologist" with 59 coloured plates.

By Mr. C. H. Moore:—A number of freshwater shells collected in November from the canal at Stalybridge.

By Mr. G. C. Spence:—A large series of Unionidæ from various African localities.

The Special Exhibit was:—*Trivia* and *Pustularia*.

Mr. G. C. Spence in the chair.

Dr. Karl L. Pfeiffer, Rammelsburg, Kassel—W., Germany (introduced by A. S. Kennard and J. W. Jackson).

K. Howell, 50 Woodside Avenue, Burley Hill, Leeds, (introduced by Mrs. Morehouse and C. Oldham).

H. B. Preston. A. W. Ward.

H. H. Booker.

Two members were struck-off in accordance with Rule 4.

By Mr. G. C. Spence:—*Hendersoniella palmeri* Dall, from Alvarez Mts., San Luis Potosi, Mexico.

Mr. G. C. Spence in the chair.

Dr. Karl L. Pfeiffer. Dr. Henry Federighi. K. Howell.

"Hibernation of *Helix aspersa* Müll.," by Dr. W. D. Lang.

"Obituary Notice :—Dr. W. Polinski," by J. R. le B. Tomlin.

By Mr. G. C. Spence :—Series of *Pachnodus* from Natal.

By Mr. C. H. Moore :—Series of *Physa* from U.S.A.

Income and Expenditure Account.

RECEIPTS.				EXPENDITURE.			
	£	s.	d.		£	s.	d.
To Annual Subscriptions for 1930:				By publishing and distributing <i>Journal of Conchology</i> , Vol.			
142 at 10/-	71	0	0	xviii, no. 12	22	11	8
2 at 7/6	0	15	0	xix, no. 1	25	15	1
22 at 5/-	5	10	0	,, no. 2	30	1	5
	<hr/>			(est'd) ,, no. 3	45	0	0
	77	5	0		<hr/>	123	8
Arrears ...	7	10	0	,, Authors' Reprints ...	10	15	9
	<hr/>	84	15	,, do (estd. cost)... ..	7	10	0
„ Sale of Publications ...	32	2	0		<hr/>	141	13
„ Advertisements ...	2	3	0	Less provision made in			
„ Contribution to cost of				account for 1929 ...	35	0	0
Illustrations ...	6	17	5		<hr/>	106	13
				„ Warehousing Stock ...	1	10	0
				„ Fire Insurance ..	0	10	0
				„ Subscriptions :			
				Zoological Rec. 2 2 0			
				Lancs. & Chesh.			
				Fauna Com'tee 0 5 0—	2	7	0
				„ Officers' Expenses ...	8	5	1
				„ Balance, being excess of			
				income over expenditure	6	11	5
	<hr/>				<hr/>		
	£125	17	5		£125	17	5

Life Membership Fund.

To amount of Fund, Jan. 1st, £ s. d.	£ s. d.
1930 274 7 10	„ Amount of Fund, Dec.
„ Dividends and Interest 14 1 4	31st, 1930 288 9 2
<u>£288 9 2</u>	<u>£288 9 2</u>

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<u>£213 15 1</u>	By Amount of Fund
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BALANCE SHEET.

<i>Liabilities.</i>	£ s. d.	<i>Assets.</i>	£ s. d.
Annual Subscriptions paid in advance 5 5 0		4% Funding Loan, £338 0 5	
Est. cost of <i>J. of C.</i> , vol. xix, no. 3, and Authors' Rep'ts 52 10 0		cost 275 0 0	
Life Membership Fund ... 288 9 2		4½% Conversion Loan, ...	
Research Fund 213 15 1		£202 13 3	
Balance of Income		cost 200 0 0	
& Expenditure A/c		Cash at Bankers 94 1 9	
January 1st, 1930 2 11 1			
Balance for 1930 6 11 5			
<u>9 2 6</u>			
<u>£569 1 9</u>			<u>£569 1 9</u>

NOTE.—Assets in addition to those set out in the Balance Sheet are (a) Library; (b) Cabinets and Collections; (c) Stock of unsold Publications; (d) Annual Subscriptions in arrear.

CHAS. OLDHAM,

Audited and found correct, 10th January, 1931.

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VOL. 19.

JULY, 1931.

No. 5.

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ADDRESS UNKNOWN.

- Lawson, Peter, F.R.M.S.

Amphipeplea glutinosa (Müll.) in E. Kent.—I was greatly interested in reading the note of Mr. J. E. Cooper in the recent number of *The Journal of Conchology*, March 1931, as to the original British locality of this shell. May I add that in August 1914 and 1915 I took the same in the marshes at Minster Monkton. It was fairly abundant in the ditches. These marshes are 2 to 3 miles S. or S.E. of the Chislet Marshes, nearer to the R. Stour.—E. PERCY BLACKBURN, April, 1931, Newcastle-on-Tyne.

Cardium (Trachycardium) hornelli Tomlin.—In this *Journal*, vol. xviii, p. 194, I gave the above name to *C. maculosum* Sowerby *non* Wood. I find, however, that Dall in *Proc. U.S. Nat. Mus.*, vol. xxiii, p. 389, 1900, had already renamed it *pristipleura*, and my *hornelli* of course sinks as a synonym of Dall's name.—J. R. LE B. TOMLIN.

To the memory of my father,
D. Birase, the 7th anniversary of whose death fell
on May 25th, 1931.

SCAPHOPOD MOLLUSKS FOUND IN JAPAN.

BY SHINTARO HIRASE.

(Read before the Society, May 9th, 1931).

PLATE III.

FAMILY DENTALIIDÆ.

Genus **Dentalium** Linnæus.*Dentalium* Linnæus, Syst. Nat., ed. 10, p. 785, 1758.Type.—*Dentalium elephantinum* Linnæus (Amboyna).

I have mainly followed the opinion of John B. Henderson and decided to divide the Japanese *Dentalium* from conchological aspects into the following six subgenera.

Subgenus *Dentalium* Linnæus, 1758.,, *Antalis* H. and A. Adams, 1854.,, *Fissidentalium* Fischer, 1885.,, *Lævidentalium* Cossmann, 1888.,, *Graptacme* Pilsbry and Sharp, 1897.,, *Fustiaria* Stoliczka, 1868.

Synopsis of the Subgenera.

Aperture : Polygonal (6, 7, 8, 9 ribs and more).

Sculpture : Primary ribs prominent ; 6, 7, 8, 9 and more in the Japanese forms.

Apical feature : Apparently no notch or slit.

Size : Medium (28—76 mm.) . . . *Dentalium*, p. 132.

Aperture : Almost round.

Sculpture : Many fine riblets near the apex, vanishing toward the aperture.

Apical feature : Very weak notch on the convex side.

Size : Small or large and slender (14-100 mm.) . . . *Antalis* p. 132.

Aperture : Round or subround.

Sculpture : Very many riblets.

Apical feature : A long narrow slit on the convex side.

Size : Large or very large . . . *Fissidentalium*, p. 132.

Aperture : Round.

Sculpture : None to the naked eye.

Apical feature : A small slit on the convex side.

Size : Small (31, 33-42 mm.) . . . *Lævidentalium*, p. 132.

Aperture : Round.

Sculpture : None to the naked eye.

Apical feature : The apical slit is very weak.

Size : Small and slender (30, 36 and 37 mm) . . . *Graptacme*,
p. 133.

Aperture : Round.

Sculpture : None.

Apical feature : A linear long slit on the convex side.

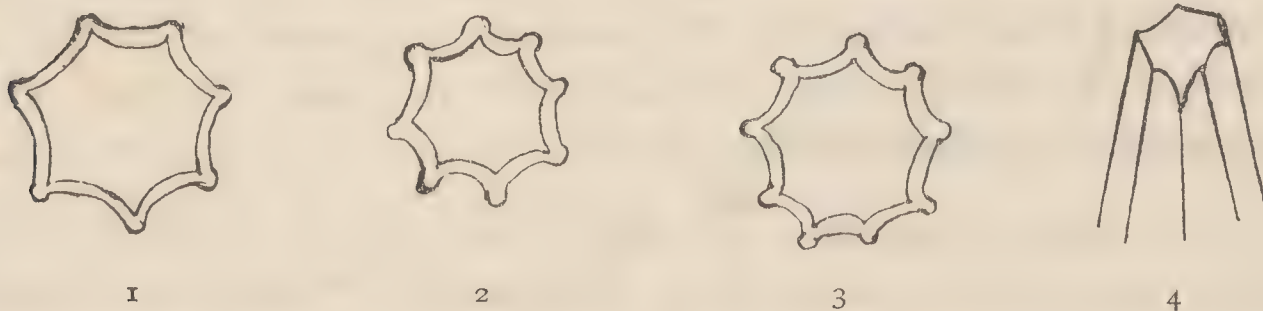
Size : Small (26, 32 and 34 mm.) . . . *Fustiaria*, p. 133.

Dentalium (Dentalium) octangulatum Donovan (plate 3, fig. 1).

Nom. Jap., Yakadotsunogahi.

Dentalium octangulatum Donovan, Nat. Hist. Brit., Shells, Vol. V.
pl. 162, 1803.

The shell is not small and well curved ; solid but not thick. It is white or white with cartridge buff in colour, and is not polished. The sculpture consists of 7 (text.-fig. 1) (2 cases in 10 specimens), 8 (text.-fig. 2) (6 cases in 10), or 9 (text.-fig. 3) (2 cases in 10) rounded longitudinal ribs, which are extremely strong towards the apical orifice,



and are parted by rather deep concave intervals with several or many unequal longitudinal striæ usually ; and growth lines are slight. The apical orifice is minute and a little channelled on the convex side but without a slit (text.-fig. 4). The aperture is somewhat oblique, usually octagonal. Of the ten specimens from Kii which I have examined, the smallest one measured 28 mm. and the largest one 55 mm. The following is a table of their measurements, arranged in the upward order : 28, 37 (2 cases), 40, 41, 43, 46, 49, 55 mm.

The largest one was heptagonal. Taking the length of the shell as 1, the ratio of the diameter of the aperture to the shell length is as follows :

0.143, 0.108 (2 cases), 0.112, 0.097, 0.146, 0.108, 0.092 and 0.090.

Thus I understand that the ratio of the diameter of the aperture to the shell length in this species varies from 0.09 to 0.146.

Localities : Boshu, Sagami, Izu, Ogasawara Jima, Kii, Awaji, Nagasaki, Riu Kiu and Hakodate.

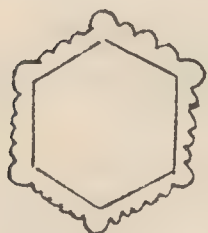
Dentalium (Dentalium) hexagonum Gould (plate 3, fig. 2).

Nom. Jap. Mukadotsunogahi.

Dentalium hexagonum Gould, Proc. Bost. Soc. N. H. Vol. VII, p. 166, 1859.

Dentalium sexcostatum Sowerby, Thes. Conch., III, p. 103, pl. 223, f. 11, 1860.

The shell is somewhat slenderer than the previous species; bony and rather curved. It is white in colour and is not polished. The sculpture consists of 6 (text-fig. 5), rarely 7 (one case in seven specimens) rounded longitudinal ribs, which are strong toward the apical orifice as in the previous species. Each interval is not



5

so deeply concave as in the previous species but rather flat and has many very fine interstitial riblets. The growth-lines are somewhat distinct and make the reticular condition, crossing the longitudinal interstitial riblets.

The apical orifice is also minute, with no slit. The aperture is usually hexagonal (text-fig. 5), rarely heptagonal in form and somewhat laterally compressed. Of the 7 specimens captured in Hizen, Kii, which I have examined, the smallest one measured 52 mm. and the largest 63 mm. The following is the table of their length, arranged in the upward order: 52, 54, 55, 58, 59, 62 and 63 mm.

The one which measures 59 mm. is the only shell which is heptagonal in form, and the rest are all hexagonal. Taking the length of the shell as 1, we have the following table of the ratio of the diameter of the aperture to the shell length: 0.096, 0.092, 0.090, 0.078, 0.085, 0.081 and 0.079.

Judging from the 7 specimens which I have examined, I understand that the ratio of this species varies from 0.079 to 0.096; in this point the species is considerably different from the previous one.

Localities: Awaji Fukura, Hirato, Nagasaki and Bay of Tokyo.

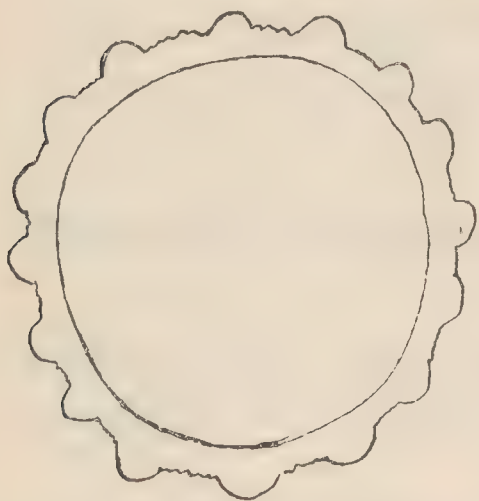
I have 8 specimens from Nagasaki which I think are analogous to Sowerby's *sexcostatum*; I find that the largest one measures 70 mm. and the smallest 58 mm. On the whole, they seem to be somewhat longer than *hexagonum*, but there is no great difference in the ratio of the aperture to the shell length. And thus I think that it is not necessary to distinguish them as a different species or a variety. Also there is no distinctive difference in the condition of the ribs or the sculpture of the shell. The only distinctive characteristic worth attention is the bluish black colour bands in the 2 or 3 specimens; but this is not strong enough to make it necessary to regard them as a different species or variety. I am of the opinion that they must be included in the *hexagonum*.

Dentalium (Dentalium) formosum Adams and Reeve (plate 3, fig. 3).

Nom. Jap., Nishikitsunogahi.

Dentalium formosum Adams and Reeve, Zool. H. M. S. Samarang, Moll., p. 71, pl. 5, f. 1, a, b, 1848.

The shell is medium or somewhat large; tumid; solid and thick. It is very beautifully variegated with dark nigrosin violet, rose, olive-green and white, but not polished. The sculpture consists of 16 rounded longitudinal ribs and each interval is narrow and has a few fine interstitial riblets (text-fig. 6). In these respects and also in the colour of the shell it differs distinctly from the previous species. The growth-lines are not distinct. In both of the two specimens from Kagoshima I have the apical parts are broken. The aperture is nearly circular, and modified by the 16 ribs (text-fig 6). The length of the two specimens is roughly 70 mm. and 75 mm. respectively. The ratio of the diameter of the apertures of the speci-



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mens to the shell length is 0.0857 and 0.0840.

Locality: Kagoshima.

Dentalium (Antalis) weinkauffi Dunker (plate 3, fig. 4).

Nom. Jap., Tsunogahi.

Dentalium weinkauffi Dunker, Malak. Bl., XXIV, p. 68, 1877.

The shell is generally large and nearly straight but the smallest third of the shell is somewhat curved; solid but not thick. It is sea-shell pink in colour, fading to whitish toward the aperture; sometimes wholly white; sometimes shining. The sculpture is rather distinct; many (about 14-16) fine longitudinal threads at the apical part; indistinctly alternating larger and smaller, and gradually vanishing toward the aperture. The large third is almost smooth and polished. The interval is narrow and flat, and has a few very fine striæ. Growth-lines are somewhat conspicuously developed. The aperture is round (text-fig. 7), white, becoming orange-chrome far within. The apical orifice is narrowly ovate, passing into a small notch on the convex side (text-fig. 8). The ratio of the length of the notch to the shell length is 0.0236.



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8

The demensions of five specimens from Awaji, which I have examined are as follows:—

No.	Shell length.	Diameter of aperture.	Ratio of diameter to length.
1	100 mm.	8.4 mm.	?
2	85 mm.	7.0 mm.	0.082
3	80 mm.	8.0 mm.	?
4	45 mm.	6.0 mm.	?
5	28 mm.	3.5 mm.	0.125

As most of the apical part in these specimens (1, 3 and 4) is more or less broken, I was unable to get the exact shell length. So I took the ratio between the diameter of the aperture and the shell length in regard to Nos. 2 and 5, which is as follows: 0.0823 and 0.125.

Localities: Awaji, Sagami and Kii.

Dentalium (Antalis) buccinulum Gould (plate 3, fig. 5).

Nom. Jap., Himenagatsunogahi.

Dentalium buccinulum Gould, Proc. Bost. Soc. N. H. VII, p. 166, 1859.

I have observed the following five specimens out of the fourteen specimens taken in Noto, Hizen and Osumi, omitting the comparatively incomplete ones.

The shell is small and somewhat curved; milky white, sometimes with small buff yellow spots, and rather polished. The sculpture is not distinct. About 30 very fine longitudinal threads are recognizable only on the apical part that is about $\frac{1}{3}$ of the shell length and gradually vanish towards the aperture. The $\frac{2}{3}$ of the larger part of the shell is smooth and polished. The interval is not deep and has only one or two fine striæ. Growth-lines are not conspicuous. Aperture round and white (text-fig. 9). The apical orifice is minute and round, with a very small slit on the convex side. The lengths of the 5 specimens are as follows:—35, 25, 22, 18, and 13 mm. The ratio of the diameter of the aperture to the shell length is as follows:—0.0814, 0.120, 0.113, 0.138, 0.153.

Localities: Noto, Osumi, Oshima, Hizen and Kiushiu.

The shells of this species are, on the whole, much smaller than those of the preceding; they are also distinguished from the previous species by their finer longitudinal threads and the greater number of them.

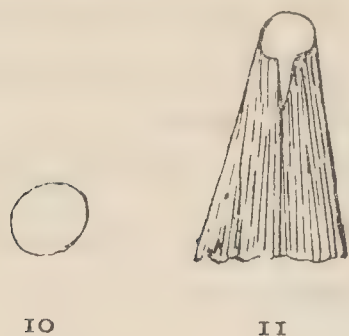
Dentalium (Antalis) pretiosum Sowerby (plate 3, fig. 6).

Nom. Jap., Migakimarutsuno.

Dentalium pretiosum (Nutt.) Sowerby, Thes. Conch., III, p. 95, pl. 225, f. 57, 1860.

I have only one complete specimen which came from Hirato. The shell is longer than the previous species and somewhat curved; solid but thin. It is opaque white, ivory-like with some light buff

rings. The condition of the sculpture is like *weinkauffi* but longitudinal threads are very fine and numerous and almost unrecognizable to the naked eye. The latter fact is one of the characteristics of this



species. The growth-lines are also very faint. The aperture is round and rather thin; white in colour (text-fig. 10). The apical orifice is oblong (text-fig. 11), continued in a short notch on the convex side, but the notch is somewhat longer than in the previous species.

The ratio of the notch to the shell length is 0.260. The length of the shell is 46 mm. The ratio of the diameter of the aperture to the shell length is 0.115.

Localities: Hirato and Kiushiu.

Dentalium (Fissidentalium) vernedei Sowerby (plate 3, fig. 7).

Nom. Jap., Futotsunogahi.

Dentalium vernedei Sowerby, Thes. Conch., III, p. 101, pl. 223, f. 3, 1860.

The shell is large; much curved and solid. It is white with some maize yellow or canthine orange rings and the part near the aperture is always white. There is no distinct difference between the ribs and riblets; some of the riblets changing into ribs especially on the small part of the shell. These rounded ribs (or riblets) are very numerous (about 36-37 in number) and are placed at short intervals. The growth-lines are close. The aperture is round, at nearly a right angle with the tube, and white (text-fig. 12). The apical orifice is somewhat oblong (not circular) with a long, prominent slit on the convex side (text-fig. 13). The ratio of the length of the slit and the shell length is 0.098. The shell lengths of the 3 specimens captured in Kii are as follows:—132, 122, 112 mm.



The ratio of the diameters of the apertures to the shell length taken as 1 are as follows: 0.094, 0.099, 0.107.

Localities: Kii and Satsuma.

Dentalium (Fissidentalium) hungerfordi Pilsbry and Sharp (plate 3, fig. 8).

Nom. Jap. Hiratsunogahi.

Dentalium hungerfordi Pilsbry and Sharp, Tryon's Man. of Conch. Vol. XVII, p. 84, 1897.

Dentalium compressum Sowerby, P.Z.S., p. 569, pl. 28, f. 18, 1888.

The shell is not so long as those of the previous species; and is solid and somewhat curved towards the apex. It is baryta yellow with some light orange-yellow irregular bands, not polished. The condition of the sculpture is almost the same as in the case of the previous species, but planoconvex unequal riblets are enormously numerous in number (about 70). The aperture is rather oval (13×10 mm. or 10×9 mm.) and somewhat thin (text-fig. 14). The apical orifice is round with a long and prominent slit on the convex side (text-fig. 15). I have only one comparatively complete specimen belonging to this species, which was captured in Kii. It is a matter of regret that I cannot make use of a specimen captured in Tosa, because its apical part is much injured.

The ratio of the apical slit of the specimen captured in Kii to the shell length is 0.162. In this point this species is somewhat different from the previous one. The shell length measures 77 mm. Here again it is different from the previous species. The ratio of the largest diameter of the aperture to the shell length is 0.168. This is another point which distinguishes the present species from the previous species. As I have already described, this species is greatly different in such points as the riblets, shell colour from the previous species.



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Localities: Kii, Tosa Kashiwajima.

Dentalium (**Lævidentalium**) **lubricatum** Sowerby? (plate 3, fig. 9).

Nom. Jap., Migakimarutsuno.

Dentalium lubricatum Sowerby, Thes. Conch., III, p.97, pl. 225, f. 56, 1860.

The shell is rather small, curved and porcellanous. It is milky white and polished. The sculpture is very weak and is unrecognizable to the naked eye. Under the magnifying glass many very fine fibrous lines are perceived on the smaller part of the shell. The apical orifice is round with a small but distinct slit on the convex side (text-figs. 16 & 17). The ratio of the length of the slit to the shell length is 0.027. I have ten specimens of this species which were captured in Awa. But to my regret there is only one specimen which is complete in form, the others being all more or less defective in their apical part. The following results have been obtained by examining the one complete specimen. The shell length is 36 mm. and the largest diameter of the aper-



16



17

ture 5 mm. The ratio of the largest diameter of the aperture to the shell length is 0.138.

Locality: Awa.

I believe that this specimen may be identified with *lubricatum*, but there remains some doubt.

Dentalium (Graptacme) aciculum Gould (plate 3, fig. 10).

Nom. Jap., Marutsunogahi.

Dentalium aciculum Gould, Proc. Bost. Soc. N. H., Vol. VII, p. 165, 1859.

The shell is rather small; thin and somewhat curved all over especially towards the apical part. It is milky white with glassy lustre. The sculpture is very fine and close only near the apical orifice, and the remaining part of the shell is smooth and polished.

The growth-lines are also very faint. The aperture is round and thin, and white in colour (text-fig. 18). The apical orifice is also round and small with a slight notch on the convex side. The shell lengths of the three specimens captured in Oshima are as follows:—30, 36, 37 mm.



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The ratio of the diameter of the aperture to the shell length is as follows: 0.083, 0.080, 0.075.

As is clear from the above, the ratio of the smallest shell is the largest, and the value diminishes as the length of the shell increases.

Dentalium (Fustiaria) numatai, nov. sp. (plate 3, fig. 11).

Nom. Jap. Mizonagatsunogahi.

The shell is small, rather curved, thin and fragile. It is milky-white, somewhat translucent, and very glossy and polished.

The sculpture is entirely absent except weak growth-lines. The apical orifice is minute and round and the apical slit is extremely narrow, linear and long. The ratio of the length of this slit to the shell length is 0.215-0.218. The aperture is exactly round and thin (text-fig. 19). The ratio of the diameter of the aperture to the shell length is 0.093-0.107. I have ten specimens captured in Osumi, but there are only two whose apical points are in good condition. The one is the largest of the ten specimens, and measures 32 mm. in length; the other is the smallest, measuring 26 mm. in length.



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Localities: Osumi and Oshima.

This species is closely allied to *Dentalium stenochizum* Pilsbry and Sharp, but the length of the apical slit is shorter; the curvature of the shell is not so strong as in *stenochizum*, and the aperture is exactly round. I think this should be specified as a new species.

FAMILY SIPHONODONTALIIDÆ.

Genus *Siphonodentalium* Sars.

Siphonodentalium Sars, Forh. Videnskabs Selskabet Christiania, 1858, p. 52, 1859.

Subgenus *Pulsellum* Stoliczka, 1868.

Siphonodentalium (*Pulsellum*) *ozawai* Yokoyama? (plate 3, fig. 12).

I have 45 specimens captured in Noto, which vary from 11 to 7 mm. in length. The shell is very small and rather deeply curved, not thin and somewhat fragile. It is milky-white, polished and translucent. The sculpture is absent except for microscopic growth-lines. The apical orifice is minute, round, without any lobes or teeth. The aperture is nearly round but somewhat compressed in the dorso-ventral direction and oblique (text-fig. 20). The ratio of the diameter of the aperture to the shell length is as follows :

No.	Shell length.	Ratio of diameter of aperture to shell length.
1	11 mm.	0.118
2	9 mm.	0.133
3	8 mm.	0.162
4	7 mm.	0.199

As is obvious, the ratio becomes smaller as the shell length becomes larger. Also the aperture seems to be bigger in proportion to the shell length.

Locality : Noto.

I have other specimens than the above-described twelve species; but there is no deciding to which species they belong at this moment.


As to the shell "arc" in this paper, I use only comparative terms, classifying into five stages; much curved; well curved; rather curved; somewhat curved, and nearly straight. Henderson states as follows: "The 'arc' of the shell is a measure of curvature determined by the distance in millimeters from a line connecting the apex and aperture to the highest point above it in the concave arch of shell."

But I have found it quite impossible to take exact measures of the curvature, because the concave part of the shell varies somewhat in individual specimens, and, moreover, the curvature differs in the young and adult.

There is some doubt about Japanese *Cadulus*, so *Cadulus belcheri* Pilsbry and Sharp has been omitted in this paper.

ILLUSTRATIONS.

(All figures on this plate are natural size).

- Fig. 1. *Dentalium* (*Dentalium*) *octangulatum* Donovan.
Fig. 2. *Dentalium* (*Dentalium*) *hexagonum* Gould.
Fig. 3. *Dentalium* (*Dentalium*) *formosum* Adams and Reeve.
Fig. 4. *Dentalium* (*Antalis*) *weinkauffi* Dunker.
Fig. 5. *Dentalium* (*Antalis*) *buccinulum* Gould.
Fig. 6. *Dentalium* (*Antalis*) *pretiosum* Sowerby.
Fig. 7. *Dentalium* (*Fissidentalium*) *vernedei* Sowerby.
Fig. 8. *Dentalium* (*Fissidentalium*) *hungerfordi* Pilsbry and Sharp.
Fig. 9. *Dentalium* (*Lævidentalium*) *lubricatum* Sowerby?
Fig. 10. *Dentalium* (*Graptacme*) *aciculum* Gould.
Fig. 11. *Dentalium* (*Fustiaria*) *numatai* nov. sp.
Fig. 12. *Siphonodentalium* (*Pulsellum*) *ozawai* Yokoyama.
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ABNORMAL LAND AND FRESHWATER SHELLS.

By H. SOWDEN.

(Read before the Society, December 3th, 1930).

PLATE IV.

EXCEPT where otherwise stated, the specimens herein described were found by me and all but the first were taken in the vicinity of York.

The sinistral example of *Hygromia hispida* illustrated in pl. 4, fig. 1, was met with in a lane beside the railway station at Thornton Dale, near Pickering, where *Vallonia costata*, *Pyramidula rotundata* and *Jaminia cylindracea* are fairly plentiful. It and two half grown individuals of *Hygromia striolata* were adhering to a dry-built wall made of a kind of limestone. Continued search failed to reveal another sinistral form, or even a typical specimen of *H. hispida* or a full-grown *H. striolata*. The only other species of shell-bearing molluscs in addition to the above were *Helix aspersa* and *H. nemoralis*, which were amongst the nettles at the base of the wall.

My friend Mr. J. W. Davis has given me another rare shell, a nice specimen of *Helix aspersa* monst. *cornucopia*, a remarkable example of extreme scalarity, which he found on a cabbage in his garden at Acomb, near York, on 22nd July, 1930 (pl. 4, fig. 2). Unfortunately he had killed and extracted the animal from its shell. Had he kept it alive, it might have been possible to rear it to maturity.

The only specimen of *Helix aspersa* m. *cornucopia* previously seen was found by the late Mr. J. Cockerill of York in 1895, also at Acomb. About the same time and at the same place he found two fine full grown specimens of *H. aspersa* monst. *subscalariforme*, one of which is shown in pl. 4, fig. 3.

Mr. Cockerill, who did not become interested in conchology until late in life and only collected for a period of five or six years, seems to have had unusual good fortune during this short time. On 12th September 1896 he found on Poppleton Road, less than a mile from the village of Acomb, a perfect full grown sinistral *Helix hortensis* (pl. 4, fig. 4). It is a fine specimen which in colour very closely approaches the variety *lilacina*. The soil of this district is of a fine sandy nature.

In September 1910 a half-grown specimen of *Helix aspersa* monst. *subscalariforme* was found in my garden in Belle Vue-street, Heslington-road, York; also ten specimens of *H. aspersa* var. *exalbida* in various stages of growth from my own and neighbouring gardens.

These were kept alive in order to try experiments as to their homing instincts. A snug retreat was built for them and about a week later all but two of the *exalbida* had left.

In the following April the subscalariform specimen was found to have hibernated in a small frame in my garden, containing *Calceolaria* cuttings. It was kept in confinement with the two remaining *exalbida* and reared to maturity by feeding it on lettuce and chrysanthemum. During the following year several specimens of the variety *exalbida* were found in my own and neighbouring gardens, but it is uncertain whether they were the same that had escaped the previous autumn, as there were no distinctive features about them to make identification certain.

In the spring of 1895, whilst the water in the river Foss was lowered between Yearsley locks and the locks at Castle Mills Bridge, York, for the purpose of repairing the banks of the river, many freshwater species were gathered. These included a specimen of *Planorbis carinatus* which had deviated from the normal in having a distinct ridge or keel situated about midway between the suture and the periphery, as well as the usual one round the periphery. Whether this is due to injury is uncertain, but whatever the cause, it must have occurred early in life, as can be seen in pl. 4, fig. 5.

Chaloners Whin, to the west of York, adjoining Askham Bogs, used to be a very good place for freshwater species. It consists of a series of ponds with a ditch running down one side which takes the overflow of water from the ponds.

Here some curious distorted shells of *Planorbis corneus* were taken in 1912 and 1913. Unfortunately this place is rapidly becoming spoilt from a conchological point of view owing to some of the ponds being used as a depository for old tins and household refuse.

In May 1928, in a small pond at the side of the Strensall golf course, *Planorbis crista* var. *lævigata* was to be found in thousands. They were living on *Hypnum aduncum*, which was the only vegetation in the pond, except for a little grass along one side, while trees overhung the other. The only other species of mollusca in the pond was *Pisidium obtusale*. Among a large number of the *P. crista* one was found to be contorted. When about half grown the whorls had become disunited and had afterwards joined up again leaving an opening in between the body whorl and the penultimate whorl (pl. 4, fig. 6).

The curiously shaped *Helicella itala* illustrated in fig. 7, was taken at Millington Springs near Pocklington in July 1928. It has the body whorl underneath the others. The habitat was a steep grassy slope, the soil being of a chalky nature. The associated species were *Helicella virgata* and *Helix nemoralis*, but the latter was not plentiful.

A pond at Stockton-on-the-Forest, about five miles east of York, when visited on 15th September 1920, was found well stocked with large numbers of *Acroloxus lacustris*, *Planorbis fontanus* and *Planorbis crista*. The aquatic vegetation was almost entirely composed of the floating pond weed *Potamogeton natans*. The material here collected included twenty-four specimens of *Planorbis crista* with the last whorl more or less separated from the penultimate one (pl. 4, fig. 8).

In an open ditch about one hundred yards from the eastern edge of Strensall Common *Limnæa pereger*, *Planorbis umbilicatus* and *P. albus* were found. The *L. pereger* were plentiful but the other two species were not. Here again abnormal specimens occurred. One specimen of *P. umbilicatus* (pl. 4, fig. 9), has the body whorl constructed on the under side of the previous ones. An example of *P. albus* has all the whorls disunited in the form of a spiral, as seen in fig. 10.

Judging from the number of abnormal cases that have come under my notice it seems as though the genus *Planorbis* is specially subject to malformation.

In some cases it is fairly evident that these malformations have been caused by some external injury, but how it was inflicted is a difficult problem to solve. It may be some parasite that has done the injury and thus caused a contraction of the muscles of the snail and a disarrangement of the glands that supply the shell-building material. In other cases, as in those of *H. aspersa* m. *cornucopia* and the spiral *Planorbis albus*, for example, it is not easy to determine whether the cause is internal or external and in such cases an exchange of ideas and opinions is valuable.

I am greatly indebted to Mr. S. Melmore and Mr. W. Watson for their kindness in taking photomicrographs and photographs of the specimens for me, and wish to tender them my best thanks.

EXPLANATION OF PLATE.

- FIG. 1. Sinistral specimen of *Hygromia hispida* $\times 3.9$.
- FIG. 2. Example of *Helix aspersa* showing extreme scalarity $\times 1.1$.
- FIG. 3. *H. aspersa* monst. *subscalariforme* $\times 1.1$.
- FIG. 4. Sinistral example of *H. hortensis* $\times 1.1$.
- FIG. 5. *Planorbis carinatus* with lateral keel $\times 3.9$.
- FIG. 6. Abnormal form of *P. crista* $\times 3.9$.
- FIG. 7. Deformed example of *Helicella itala* $\times 3.2$.
- FIG. 8. Abnormal specimens of *P. crista* $\times 3.9$.
- FIG. 9. Deformed specimen of *P. umbilicatus* $\times 3.9$.
- FIG. 10. Spiral form of *P. albus* $\times 3.9$.

OBITUARY NOTICE: SIR CHARLES ELIOT.

BY J. R. LE B. TOMLIN, M.A.

(Read before the Society, May 9th, 1931).

CHARLES NORTON EDGECOMBE ELIOT was born in 1864, the son of the Rev. E. Eliot, vicar of Norton Bavant in Wilts. Even in his school days at Cheltenham his acquirements were phenomenal, and when he went up to Balliol College with a classical scholarship he carried everything before him, winning all the chief classical honours as well as the Boden Sanskrit Scholarship. Even thus early he was developing into a great linguist, and as his travels became more and more extensive this gift for languages showed extraordinary range and accomplishment. Many years ago he was credited with being able to speak 23, as well as possessing considerable knowledge of several others.

After leaving Oxford he entered the Diplomatic Service, and in 1887 joined the staff of Sir Robert Morier at St. Petersburg. Two months later he was drawing the allowance for knowledge of Russian, and when transferred to Tangier in 1892 he obtained a similar allowance for Arabic in 3 months. At Constantinople in 1893 he was drawing the allowance for Turkish almost immediately after arrival. After successive posts at Sofia, Belgrade and Washington, he acted in 1899 as British High Commissioner to report, in conjunction with the representatives of Germany and the United States, on the trouble in the Samoan Islands.

In 1900 he was appointed Agent and Consul-General for Zanzibar and British East Africa, but resigned after a conflict of opinion with Lord Lansdowne as to land grants.

In 1905 he became Vice-Chancellor of Sheffield University and in 1912 the first Principal of the new University of Hongkong. From 1919 to 1926 he was our Ambassador in Japan.

He died in March last on board ship between Penang and Colombo.

Eliot wrote many books; those by which he will be best remembered are "Turkey in Europe" (1901), "Letters from the Far East" (1907), and "Hinduism and Buddhism" (1921).

The marine zoologist will remember him by his papers on Nudi-branchs, and especially by the supplementary volume to Alder and Hancock's monograph of the British Nudibranchiate Mollusca, published in 1910.

A NEW RISSOID FROM CEYLON.

By R. WINCKWORTH, M.A.

(Read before the Society, April 18th, 1931.)

I AM indebted to Mr. J. R. le B. Tomlin for drawing my attention to the small shell here described.

AMPHITHALAMUS (ESTEAE) KIS, sp. nov.*

Shell very small, pupiform, orange-brown. The apex is smooth, glossy, regular, consisting of two and a half whorls: it continues without marked discontinuity, except of sculpture, into the lower whorls, three in number, which have a strongly plicate sculpture of slightly oblique longitudinal ribs, sixteen to eighteen on each whorl: at the upper or posterior end the plicae are tucked so as to form a fillet at the top of each whorl: the whorls are very slightly convex, so that the sides of the shell appear nearly parallel; just before the mouth of the adult the shell is thickened and the outer lip distinctly protrudes beyond the contour of the rest of the shell. The mouth is a quadrate oval, subangular posteriorly, and the peristome is complete, thickened all round, glossy brown, sloping inwards to the mouth. The outer lip is rounded and not compressed.



Dimensions: alt. 1.3 mm., diam. 0.6 mm.

Type in coll. Tomlin, from 10 fathoms, Trincomali, with forty other specimens.

The nearest relative to this species is *Alvania olivacea* Frauenfeld, described in the Novara expedition (vol. 2, Mollusken, p. 11 and pl. 2, fig. 14) from Sydney. This differs from *kis* in the more tapering spire, the greater extent of the smooth apical area, and the more numerous plicæ (25-26 to a whorl): the mouth also is a larger oval and the outer lip is distinctly compressed. The two species are, however, closely allied, and both may be referred to Iredale's *Estea*, which differs from *Pisinna* in the presence of longitudinal folds. Thiele (Handbuch, 1930, p. 162) regards *Pisinna* (including *Estea* as a synonym) as a subgenus of *Amphithalamus*.

* Greek *κίς*, a weevil.



TROCHULA ELEGANS Gmel. IN SURREY.

By G. L. WILKINS.

ON the 25th of May 1931 I had the good fortune to find a well-established colony of *Trochula elegans* Gmelin on a grassy hillside in the parish of Chaldon, Surrey. The species was found living at the roots of grass and among small clumps of hawthorn. By the number of dead shells it would appear that the colony had been established some considerable time. The chief associated species is *H. virgata*; *Pupilla muscorum* and *Vallonia costata* are also present. One interesting point is, that the banded form of *Trochula elegans* was in distinctly lesser numbers than the var. *maculosa* Moq., only one fifth of the total number collected being banded.

On June 13th a field meeting of the London Branch was held to Chaldon, the main object being to find how far down the hillside the colony extended. Five of the members spread out to investigate, and we found that the species was more plentiful than at the top (to which part my own collecting had been restricted) for about a third of the way down, it got scarcer at the second third, almost disappearing at the foot, where there is a valley. The comparative scarcity of the banded form was still noticeable, about one in five of the total as in my previous collecting.

It was in 1890 that a Mrs. Mac Dakin first found *Trochula elegans* in England, at Kearsney. This locality is probably exhausted now, as I believe the particular spot is covered by a coal tip. It was suggested by Mr. C. J. B. Cox (who recorded *T. elegans* as British in 1891) that, judging by the position of the colony, it had been purposely introduced.

The late Canon Horsley was known to have taken a fatherly interest in this colony of *Trochula* and he tried to introduce it into other localities; was Chaldon one of his experimental sites? In the absence of any certain evidence there is no reason why we should not consider this new locality to be an example of natural distribution.



FIELD NOTES ON *HELICELLA VIRGATA* da Costa.

BY J. E. COOPER.

(Read before the Society, May 9th, 1931).

THE following brief records of variation in this snail and its distribution on different soils may perhaps be of interest.

In size this species shows remarkable variation, chiefly due to the presence or absence of lime in the soil and to the amount of food available. These two factors do not, however, account for all variations in size, there seem to be other considerations. What are they?

In Guernsey on the north-west coast the soil is sandy and deficient in lime; *H. virgata* is very small.

At Tenby Burrows the sand has more lime, and this species is medium sized and very plentiful.

At numerous places, e.g. Folkestone and Caterham, on chalky banks it is also medium sized and abundant.

At Kingsdown, near Walmer, on broken chalky ground it is exceptionally large.

These are typical localities.

On the low cliff at Southwold soil conditions would seem to be favourable, yet *H. virgata* is small and the shells dull white or greyish.

On Coulsdon Downs (Surrey), it is also small. Here the soil is chalky, but the turf is very short, so that the snails have very little shelter.

Then consider the north-east corner of Kent. From Minnis Bay in Thanet to Reculver, a distance of three miles, there is a high bank of earth, which protects the marshes. These marshes were under the sea until about 1600 A.D. and the "sea wall" was not completely finished until the end of the 18th century. All along this alluvium *H. virgata* abounds on coarse grass, wild beet, etc. At the Minnis Bay end the shells are small, elsewhere medium-sized, with a colony of large shells about one mile from Reculver. Along the cliffs from Reculver to Herne Bay this snail is entirely absent. The cliffs are Thanet Sand passing into London Clay. In the town of Herne Bay some of the vacant plots have strong colonies of small-shelled *virgata*. West of the town the London Clay cliffs of Hampton have no shells. On a sandy patch at Swalecliff there is a small colony. Then follows another gap—the London Clay cliffs of Whitstable. At Seasalter, further west, this snail is again abundant on sandy ground. The shells are medium-sized, becoming very large on the clayey sea-wall towards Graveney.

Most of these barren patches are London Clay, which *H. virgata* appears to dislike. A further reason for its absence on the cliffs is their constant erosion by sea and rain.

Along this piece of coast *H. virgata* is associated with *H. aspersa* and *H. cantiana*.

In the same area our snail extends inland for two miles along one or two of the great drains in Chislet Marshes. The shells are all small, as the turf is kept short by sheep. A very large part of these marshes has no *virgata*. This may be owing to the short time—say 140 years—since the sea-wall was completed.

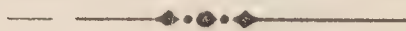
About one mile inland at Herne Bay there was in 1930 a flourishing colony of rather large shells on a low bank edging a field. Other similar banks near had no snails. Why?

The associated species here were *H. cantiana*, *H. caeperata* and *H. gigaxii*.

West Wycombe is an inland locality where the beautiful variety *hyalozonata* is plentiful. There is no lack of lime here, why should these thin translucent shells occur there?

A few miles away in a brick field at Chinnor (Oxon.) the species is quite normal, except that some specimens have yellow lips.

In Middlesex *H. virgata* is almost—if not quite—absent. But in 1920 it occurred in profusion near Yiewsley on a patch of waste covered with rubbish. The whole area was some 50 yards square. In this colony the variety *radiata* was frequent. After three years the colony dwindled away.



Sepia braggi Verco.—Professor W. L. Bragg has presented his collection of South Australian marine mollusca to the Manchester Museum, and contained in this collection is the type-specimen of *Sepia braggi*. It was described from Glenelg by Dr. J. C. Verco in Trans. Royal Soc. of South Australia, vol. xxxi, December, 1907. —J. WILFRID JACKSON.

A NEW RECORD OF ATOPOS FROM JAVA.

BY W. C. VAN HEURN.

(Read before the Society, April 18th, 1931).

ON July 27th, 1930, I happened to discover a specimen of an apparently very rare kind of slug in the jungle near the so-called "English Lawns" of Kawah Kamodjang, Goentoer Mountains, Western Java, at an altitude of about 1,600 m. above sea level. The slug lay hid beneath an almost decayed piece of wood and was hardly to be distinguished from its surroundings; so I think these animals may often be overlooked.

Miss T. van Benthem Jutting, temporary zoologist of the Buitenzorg Museum, has been so kind as to inform me that this slug must be assigned to the genus *Atopos* Simroth, and that, as far as she knew, it is only the second time that a representative of this genus has been met with in Java, the first being a specimen of *A. ouwensi* Collinge. Therefore it seems worth while giving here a short note about the finding and a provisional description of the animal's external characters.

In general the description given by W. E. Collinge of *Atopos ouwensi* (Journal of Conchology xii, p. 118, 1908) agrees pretty well with our specimen. Collinge's type, however, which had been caught in the Buitenzorg Botanical Garden, was of a dirty light brown colour with a faint tinge of green and with the extreme anterior end yellow, whereas our animal seems to be uniformly black, except the median portion of the base, which is greyish. Like *A. ouwensi* it has a granulated appearance with very small scattered tubercles in addition. Especially at the posterior part of the body it is prominently keeled. The margins of the perinotum are sharp and separated from the base by grooves. The posterior end of the mantle reaches as far as the foot; the anterior part forms a hood-like covering over the head. When alive the animal seemed to be very inert and while creeping around during the night it sometimes had two rather short ommatophores protruded; when the slug was dead the tentacles were all retracted.

Total length about 45 mm.

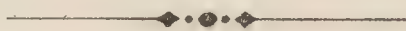
As our specimen has not been dissected I cannot give any further information about anatomical features, nor about the mutual distances between the mouth, the anal aperture and both the generative orifices.

A plain figure of our slug with a short record of its finding in Java has already been published in the Dutch East Indian monthly journal "De Tropische Natuur," vol. xx, 1931, p. 18.



Dorsal and ventral view of *Atopos* spec. Kawah, Kamodjang, Java. Natural size.

I am indebted very much to Miss T. van Benthem Jutting, through whose kindness I have been able to elucidate this note with the present new picture.



Limnæa glabra at Doncaster.—In 1925 I was persuaded to take up the study of conchology and looking through a friend's cabinet I was told *L. glabra* was not to be found in the Doncaster area. The next time my daughter and I were out cycling we were attracted by a beautiful patch of Vernal Water Starwort (*Callitriche verna*) in what was little more than a "grip" by the roadside and there, to our great delight, was *L. glabra*; we took half-a-dozen and these we had confirmed. They occurred on the Askern-Moss Road, near Doncaster. This year, 1931, on April 11th, I again visited this particular habitat and was rewarded by finding specimens. Also *A. hypnorum* and *P. spirorbis*. *A. hypnorum* we had not seen before there. The association of these three species bears out Mr. W. Nelson's article in the Journal of Conchology, Vol. iii, pp. 115 & 116, where he gives the different habitats in which he has personally found them. On the same day Miss Ida Dufty took a distorted dead shell of *P. spirorbis* which had the outer whorl formed in a loop just a small distance from the peristome.—ELSIE M. MOREHOUSE.

LOCAL EXTINCTION OF A RECENTLY ABUNDANT MOLLUSK.

By Miss NORA FISHER.

(Read before the Society, April 18th, 1931).

SOME time ago Miss Massy suggested to me that I should work out the present distribution of *Spisula subtruncata* (da Costa) in the North-East of Ireland, as it appears to be extinct in the Clyde area, where the fauna is similar to ours. A. C. Stephen² says "The recent extinction of this species round the Cumbrae and its neighbourhood has already been described¹. About 50 years ago this species occurred in such numbers that it was gathered for feeding pigs and hens, and the tracks of carts driven across the sands could be traced by the white lines of destroyed *Macra*. Not within the last twenty-five years, however, has a "full," i.e. live, one been seen." Spurred by this note I began to hunt out records of *S. subtruncata* in North-East Ireland. Thompson³ in 1856, gives "Dredged, 10-12 fathoms, Strangford Lough," and specimens thence are in the Hyndman Collection in the Belfast Museum, but do not appear to have been taken living. Hyndman⁴, 1858 gives "Brown's Bay, Island Magee, living, few," and there are specimens taken living about the same time at Ballyholme, Co. Down, in the Waller Collection in the National Museum, Dublin. Miss Massy tells me she has specimens taken alive at Groomsport, Co. Down, by Dr. Praeger, but I can find no other record of living *S. subtruncata* being taken in this district during the last 40 years, except a few living specimens dredged in Church Bay, Rathlin Island, by Dr. Chaster⁵ in 1897.

Rev. G. A. Frank Knight⁶ in 1901 states that *S. subtruncata* at Portstewart, Co. Derry, is "frequent; more coarse in appearance than those found so abundantly on our Ayrshire coasts," but when I wrote to him and asked whether any living specimens had been found he replied that his remarks "referred to the *shell*, not to the animal inside."

During a week's stay at Portstewart this spring I did not even find a valve. In two days' dredging in Strangford Lough last autumn

1. "Local Extinction of a Recently Abundant Lamellibranch." Richard Elmhirst and A. C. Stephen, B.Sc. *Nature*, 123, p. 606 (1929).

2. "Studies on the Scottish Marine Fauna. Additional Observations on the Fauna of the Sandy and Muddy Areas of the Tidal Zone." A. C. Stephen, B.Sc. *Trans. Roy. Soc. Edinburgh*, 56, pt. 2, p. 624. 1929-1930.

3. "Natural History of Ireland," 4, p. 348. (1856). William Thompson.

4. "Report of the Belfast Dredging Committee for 1858." G. C. Hyndman. *British Association Report*, 1858.

5. "A Day's Dredging off Ballycastle, Co. Antrim." G. W. Chaster. *Irish Naturalist*, 6, p. 120 (1897).

6. "Notes on the Marine Mollusca of Portstewart, North Ireland." Rev. G. A. Frank Knight, D.D., F.R.S.E. *Trans. Nat. Hist. Soc. Glasgow*, 6 (new series) pt. 1., p. 1 (1901).

only worn old valves were found, and in 13 years' shore-collecting, chiefly around Belfast Lough, I have never seen a living specimen, nor even found fresh valves. Most of the valves I found were old and worn, and those I found so abundantly on the north shore of Belfast Lough were unmistakably estuarine clay fossils. This species certainly appears to be extinct in North-East Ireland, as in the Clyde area.



ADDITIONAL NOTES ON THE LAND AND FRESHWATER MOLLUSCA OF SUSSEX.

By J. GORDON DALGLIESH, F.L.S.

(Read before the Society, February 5th, 1930).

Theba cantiana, var. **rubescens**, Moq.-Tan. —Swanton (Zoologist, 1915) gives Lewes and Guestling. I took it with the type at Shoreham, Seaford and West Blatchington.

Var. **albida** Taylor. —Not uncommon with the type at Shoreham.

Var. **albocincta** Cockerell. —Shoreham, June, 1929. Rare, taken with the type.

Theba cartusiana Müll. —A fresh locality for this very local species was discovered by Mr. A. G. Stubbs between Shoreham and Beeding.

Cepæa nemoralis Linn. var. **castanea** Moq.-Tan. —Specimens taken at West Blatchington grade from an almost *rubella* form to *olivacea*. Here is to be found the *castanea* "approaching the colour of a horse chestnut" (Taylor), the subvar. *petiveria*, Taylor, fawn-coloured, and the subvar. *fulvotincta*, a pale fulvous or pinkish-yellow.

With the rare exception of 00300, all the *castanea* forms hitherto obtained are 00000.

Cepæa hortensis Müller. —A form taken at West Blatchington in June, 1929 is a typical 12345 with a dark outer lip and an inner pink one. Another 12345, a *minor* form measuring 18 × 16 mm., has the reddish ground colour of *incarnata*. This form has been taken at West Blatchington and Henfield.

Viviparus viviparus Linné. —Hitherto very few localities in Sussex have been recorded for this species. Harting (vide Zoologist, 1915) has a very doubtful record from Pevensey Level and the Marsh drains between Siddlesham and Selsea. Borrer (Zoologist, 1878)

records it from the River Arun. There are poor specimens in the Borrer Collection at the Brighton Museum from this locality. Last year, 1929, Mr. A. G. Stubbs procured several examples at Pulborough.

Sphærium corneum Linné.—Jenner (Proc. Eastbourne Nat. Hist. Soc. 1884-85) records *Sphærium ovale* Fér. from near Lewes. In all probability Jenner identified a large *Sphærium lacustre* Müll., or *Sphærium corneum* Linné, var. *scaldiana* Norm., which on superficial examination resembles *ovale*. Specimens of the var. *scaldiana*, somewhat flat, smooth and glossy, resembling *Sphærium lacustre* Müll., were taken from a marsh drain at Shoreham in June, 1929.

Sphærium lacustre Müll.—Unusually large and fine specimens were taken in June, 1929 in a disused dew pond near Seaford, Cuckmere Valley. One example gave 15×16 mm. and was very strongly striated. Most contained fry. With the exception of *Limnæa peregra* Müll. this was the only species in the pond.



PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN & IRELAND.

590th Meeting, held at the Manchester Museum, in conjunction with the
Leeds Branch, 18th April, 1931.

The President, Mr. R. Winckworth, M.A., in the chair.

Among those present were the following :—Messrs J. Digby Firth, J. R. Dibb, K. Howell, Fred Taylor, G. C. Spence, J. C. North, H. Emmett, J. H. Goodson, B. Bryan, C. H. Moore, A. K. Lawson, J. W. Jackson and Mrs. Morehouse (President of the Leeds Branch).

Additions to Library and Cabinet announced and Thanks Voted.

Papers from Prof. T. D. A. Cockerell, Messrs R. A. Phillips, H. Watson, H. Burrington Baker, H. Schlesch and Cæsar R. Boettger.

Shells from H. Schlesch.

Candidates Proposed for Membership.

Dr. W. F. Buckle, Arrow Lodge, Alcester, Warwickshire (introduced by H. H. Bloomer and R. Winckworth).

Miss Helen I. Tucker, De Pauw University, Dept. of Geology, Greencastle, Indiana, U.S.A. (introduced by Walter F. Webb and J. W. Jackson).

William James Bailey, 27, Gloucester Street, Devonport, Plymouth (introduced by S. G. Finch and H. C. Fulton).

Robert Henson Moses, 42, Pembury Road, Tottenham, London, N.17 (introduced by Guy L. Wilkins and A. S. Kennard).

Resignation.

Bryant Walker.

Member Deceased.

Sir Chas. Eliot.

Papers Read.

"A New Rissoïd from Ceylon," by R. Winckworth.

"Local Extinction of a recently abundant mollusk (*Spisula subtruncata*), by Miss Nora Fisher.

"A New Record of *Atopos* from Java," by W. C. van Heurn.

Exhibits.

By Mr. R. Winckworth :—Scalariform and sinistral examples of British snails ; also Indian Rissoïdæ.

By Mr. C. H. Moore :—Shells found in peculiar places (as rabbit burrows, etc).

By Mr. G. C. Spence :—Selection of Urocoptidæ, mainly from Cuba.

By Mrs. Morehouse :—Series of *Cerion*.

By Mr. K. Howell :—*Limax maximus*, and v. *ferussaci*, *Milax gracilis*, and black forms of *Agriolimax agrestis*, all found in Leeds.

By Mr. A. K. Lawson :—Sinistral *Helix aspersa* from Southport ; bilabiate and contorted *Linnæa stagnalis* from Ashley Mill, Cheshire ; series of shells attacked by various enemies as birds, animals, and insects ; shells bored by *Nucella lapillus*.

By Mr. B. Bryan :—*Pisidium* sp. attached to leg of Water-Boatman (*Notonecta glauca*) ; *Sphærium corneum* attached to hind-toe of Great Crested or Warty Newt (*Molga cristata*).

591st Meeting, held at the Manchester Museum, May 9th, 1931.

Mr. G. C. Spence in the chair.

Additions to Library and Cabinet announced and Thanks Voted.

Papers from Messrs H. Schlesch, R. Winckworth, Paul Bartsch, J. B. Reeside, jr., and A. Allen Weymouth, D. Aubertin, A. E. Ellis and G. C. Robson. Also Manual of Conchology, part 110 plain, from Dr. H. A. Pilsbry.

Cardium aculeatum and v. *alba*, from Paignton, from P. P. Milman.

New Members Elected.

Dr. W. F. Buckle, Miss Helen I. Tucker, William James Bailey, Robert Henson Moses.

Resignations.

Joseph Bliss.

P. de Bruyne.

Papers Read.

"List of Shells from St. Leonards," by J. Williams Vaughan.

"Field notes on *Helicella virgata*," by J. E. Cooper.

"Scaphopod Molluscs found in Japan," by Shintaro Hirase.

"Obituary : Sir Chas. Eliot," by J. R. le B. Tomlin.

Exhibits.

By Mr. A. K. Lawson :—Sub-fossil shells from Askern, Yorks. (coll. W. G. Saunders).

By Mr. C. H. Moore :—*Anodonta cygnea* from Mill Lodge, Stalybridge.

By Mr. G. C. Spence :—Series of European *Ericia* (= *Pomatias*).

EDITORIAL NOTES.

IT IS with very great regret that we record the death of Miss Anne L. Massy, of the Irish Fisheries, on the 17th April last, and that of J. W. Vaughan on June 11th.

In the "Bulletin Bi-mensuel de la Soc. Linn. de Lyon," année 10, no. 6, 22/3/31, M. le Commandant Caziot publishes a longish résumé as to the status of the name *Helix revelata* auct. (nec Férussac nec Michaud), based entirely on Kennard and Woodward's paper in Proc. Mal. Soc. xiii. 133.

Prof. Cockerell last year sent to "Nature" a photograph of two figures carved on a wall at Karnak which he fairly confidently identified as representations of his *Veronicella nilotica*—a slug found on the banks of the Nile above Khartum (*Nautilus* 23, 108), and subsequently by Mrs. Longstaff in the Bahr-el-Gebel.

Mr. Robson, however, wrote subsequently to point out that these figures undoubtedly represented the Horned Viper (*Cerastes cornutus* L.), the Egyptian hieroglyph for the letter F. It is not the first time that this has been taken for a slug; the horns resemble those of the Viper and not the tentacles of the slug, which moreover has two pairs, while the clearly defined head and slender neck of the Karnak figures are not found in *Veronicella*.

In the *Nautilus* for last April a notice appeared on the last page, convening a meeting of American conchologists at Philadelphia, with a view to the formation of some union or society of those who are interested in the mollusca.

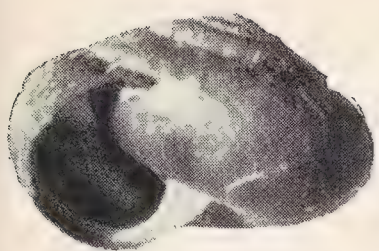
This conference was duly held on April 30, May 1 and 2, and resulted in the formation of the American Malacological Union with some 125 original members.

One evening was occupied by a lecture given by Dr. Bartsch, on the Land Mollusca of the West Indies. The secretary pro tem. is Mr. N. W. Lermond.

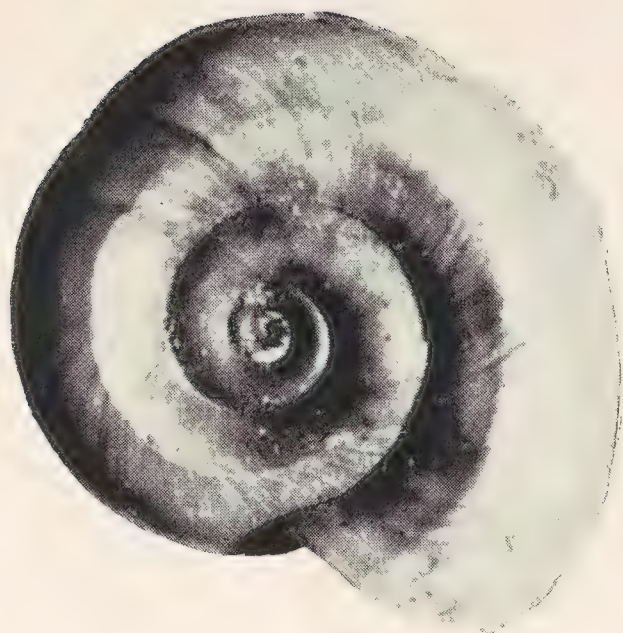
We are extremely sorry to hear of a disastrous fire at the Geological Institute of the Kyoto Imperial University in Japan.

Mr. T. Kuroda, the leading Japanese malacologist, lost his private collection of recent mollusca, including many undescribed novelties. We should like to offer Mr. Kuroda our sincerest sympathy over his irreparable loss.

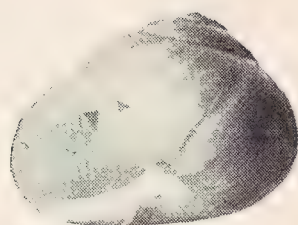




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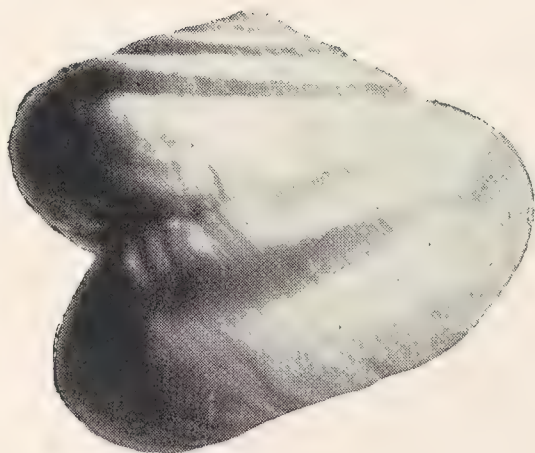
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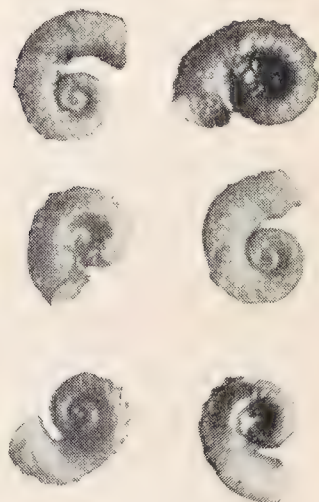
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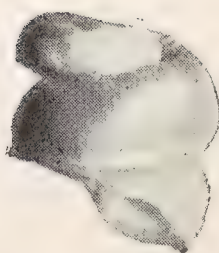
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A FACSIMILE **REPRINT** of those parts of the *Beschreibung der Naturalien-Sammlung der Universität zu Rostock* by **H. F. LINK**, 1806-1808, which refer to Mollusca is now ready. The edition is limited to 150. Copies may be obtained by application to J. R. le B. TOMLIN, 23, Boscobel Road, St. Leonards-on-Sea, Sussex, or to R. WINCKWORTH, 71, Whitworth Road, London, S.E. 25. The price is £1 (\$5.00), post-free.



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JOHN WILLIAM TAYLOR.

1845—1931.

By A. E. BOYCOTT.

(Read before the Society, December 2nd, 1931).

PLATE V.

J. W. TAYLOR was born in Leeds on February 6th, 1845 and lived there all his life. In such time as he could spare from the study of conchology he pursued the business of a colour printer with success and died in his house, North Grange, Horsforth, on September 2nd, 1931, aged 86. No one who was present at the delightful meeting which was held at the Manchester Museum on his 70th birthday in 1915 will have forgotten the occasion or the address (this *Journal*, vol. xiv, p. 317) which tried to express what the Society thought about him: he was their founder and their constant guide and friend, and his death leaves a gap which, quite literally, cannot be filled. He needs no particular monument: the Society, the *Journal*, the *Monograph* and the affection of his friends are good enough.

In early life Taylor developed his taste for natural history in connection with the East Ward Mechanics' Institute and he helped in the foundation of the Leeds Naturalists' Field Club, still flourishing. He was at first interested in entomology, especially lepidoptera, but he soon gravitated to conchology and in February, 1874 began to publish *The Quarterly Journal of Conchology*. There is nothing in my copy of the first volume (which lacks the covers of the parts as issued) to indicate that Taylor was the editor except that two unsigned notes are entered in the index as by him. The introductory preface is not signed: it is significant that it lays stress on working out geographical distribution. The second volume (1878-9) in which the title is changed to *The Journal of Conchology* is equally reticent and it is not till volume vi (1889-91) that the title page gives Taylor's name. The preface to volume vii (1892-94) announces his retirement from the conduct of the *Journal* after being "its Director and Editor for the long period of exactly twenty-one years"; he looks with satisfaction at the progress it has made and the good influence it has had on the study of conchology and hands it on to the Society under whose direction it has since been. The *Journal* was indeed the first English periodical en-

tirely devoted to its subject and, as such papers always are, was one of the chief agents in arousing again an interest in mollusca which had flagged since the period of enthusiasm and progress in the first quarter of the nineteenth century. It at first dealt mostly with British forms but soon attempted to cover the mollusca of the world: Taylor himself collected in Europe and described new species from Australia and Africa. But he seems to have come to prefer the intensive study of a few species and later restricted his interests almost entirely to British land and freshwater mollusca. The *Journal* took a corresponding bias and became what it has been since and is now: entirely catholic but at the same time predominantly British and non-marine.

The *Leeds Conchological Club* was founded on October 12th, 1876, by J. W. Taylor (1845-1931), W. D. Roebuck (1851-1919), W. Nelson (1835-1906) and H. Crowther (whom we still have the pleasure of seeing in the flesh). It was a busy organisation for it met "fortnightly on Thursday evenings, throughout the year" (vol. i, p. 185). In 1877 it became the *Conchological Society*¹ and in 1878 the *Conchological Society of Great Britain and Ireland* with Taylor as secretary. The *Quarterly Journal of Conchology* was adopted as the organ of the Society in 1878, but no *Proceedings* appeared till June, 1879 (vol. ii, p. 178) and the systematic notices of each meeting began with the 44th meeting held on April 3rd, 1879 and have continued regularly ever since. In the early years of the Society the founders were the most energetic members: Roebuck in working out the distribution of species in Yorkshire and afterwards in the British Isles, Nelson in field work and water snails, Crowther in studies with the microscope and chemical analyses and Taylor in extensive and exact learning, especially in variation. With this leadership, it is not to be wondered at that Leeds was a very active centre of conchological work and Taylor helped to teach his fellow citizens that the insides of slugs and snails were something more than "just moosh." But, as often happens, enthusiasm among the rank and file began to wane and ultimately the headquarters of the Society were transferred in 1895 to Manchester where a flourishing branch had been started in 1888. Taylor then devoted himself entirely to the *Monograph of the Land and Freshwater Mollusca of the British Isles*. He designed that this should be as complete an account as possible of our species and towards its perfection he had been collecting material for many years with continual help from Roebuck in distribution and bibliography and from Charles Ashford (1829-1894) in anatomy. The first part was issued on October 26th, 1894, when Taylor was 49; other parts

1 See the history of the Society by J. W. Jackson in vol. xviii, p. 66.

followed fairly regularly, about one a year, up to part 23 which appeared on October 10th, 1917 when publication was suspended for the duration of the war. One more part appeared in December, 1921, and there the book ends, halfway through the section on *Xerophila virgata* and with about one quarter of the land and all the aquatic species still to do. Printing costs had increased, Taylor had always lost money on the project and he was 76 years old.

In writing of the quality of the completed parts, it is difficult to avoid using terms which must seem exaggerated. But it is, I think, true to say that they form the most complete and best illustrated account of any group of animals which has been published. Taylor took the most meticulous care over every detail, acquainting himself as far as he could with all that others had written and collecting any information he was able to accumulate from his correspondents. The illustrations, most of which are quite first rate, were a tour de force for he had no natural artistic ability and it was by sheer determination that he achieved, for example, the coloured drawings which were the basis of the wonderful plate of the forms of *Helicigona arbustorum* (plate xxxiv, 1914) which always strikes me as one of the best. Under each species is gathered together what was probably very nearly all the facts which were to be had at the time, and the accounts which are given are in that sense exhaustive. A year or two ago, after a visit to Kerry to see *Geomalacus maculosus*, I read through again Taylor's chapter on that interesting slug, and I could find only one question to which the answer was not there: does it occur on limestone as well as old red sandstone? and as far as my enquiries have gone no one does know the truth on that particular point. The parts which contain the most original information are those on the slugs, published between 1902 and 1907, which constituted the first satisfactory and intelligible description of the British species and have enabled our knowledge of this group to progress so well. In these Taylor was more than usually indebted to Roebuck and Ashford: indeed, Roebuck's share in worrying us into an interest in slugs should never be forgotten.

The book is, of course, open to criticism; it would be incredibly inhuman if it were not. The first, general, volume took six years to publish and is relatively unnecessary: in parts of it he was on unfamiliar ground and these are not very well done. References to literature are throughout given in an inconvenient way and in some instances they cannot be disentangled. The field natural history might be better: Taylor did little active field work in and after middle life and much of what he says about habitats and habits is second hand and recounts the exceptional rather than what is usual.

There is, too, everywhere an *ipse dixi* air which some people have found objectionable. I know that he examined with the most minute care what others had said and written on disputed points and he told me once that he did not consider that he was doing his duty by his own book if he simply recorded the various opinions without going fully into the matter and stating his own conclusion as far as the data allowed him to come to a definite opinion. Once he had made up his mind it was certainly difficult to persuade him to see the other side of the case, but I am sure he had no idea that his way of expressing his conclusions was apt to have something of a pontifical complexion. On subjects which he had not specially considered, he had quite an open mind.

Criticisms such as these can, of course, be levelled at any good book and I have given them more space than they deserve because the really amazing thing about the *Monograph* is that one man could bring such a project so near perfection. The sum of it all was perhaps best expressed by Prof. T. D. A. Cockerell in a letter to *Nature* in 1917 (vol. cxix, p. 84) in which he says of it "as a contribution to national culture it would abundantly pay the country to continue the printing at the public expense." How much we all wish that that could have been done.

There would be no object in enumerating all the papers and notes which he contributed to this *Journal* and the *Naturalist*: nearly all of them concern details of British conchology and he appears in them as an accurate and painstaking systematiser rather than an imaginative discoverer. The account he wrote of the local mollusca for the Hull meeting of the British Association in 1922 is a good example of what he did so well. But he was also deeply interested in some general questions and especially about the centre of origin and distribution of animal life. The original hypothesis to which he was led was elaborated at the International Entomological Congress at Oxford and crystallised in his presidential address "Dominancy in nature" to the Yorkshire Naturalists' Union in 1913 which was circulated as a pamphlet. The subject is shortly treated towards the end of the first volume of the *Monograph* and when further progress with that became impossible, he gave a great deal of time and reading to it: I do not think that he published more about it though he read a paper on it at the British Association at Leeds in 1927. His thesis briefly is that north-central Europe is the centre where animals and plants have shown the most active evolution and that as they have become more highly developed and "stronger" there, they have driven out the earlier, more primitive and "weaker" types. The British fauna and flora, for example, contains the most advanced element in the south

east, a group which has been pushed into the north and west and a yet more primitive assemblage of Lusitanian species which are nearly into the Atlantic. He goes to beetles, earthworms, plants, trees and algæ as well as mollusca for his examples, and difficult as it may be to imagine exactly how the "strong" expel the "weak," his array of facts is certainly impressive and is at any rate in accord with the natural idea that species which progress in evolution ought *ipso facto* to be in a better position to get their own way than those which do not. Similarly, his presidential address to the Society at its jubilee meeting at Leeds in 1926 deals with the evolutionary history of our British mollusca in relation to habits and habitats (vol. xviii, p. 85).

Taylor seems to have had no interests apart from natural history. He lived a quiet, retired life completely absorbed in his studies and always glad to have news of snails and to help other workers. Most of us are indebted to him for some kindness or other. No one who knew him personally could help being impressed by his sincerity and devotion to his cause and better acquaintance was sure to ripen into affection for the man himself as we came to know him more and understand his foibles.

Our portrait was taken when the University of Leeds conferred the degree of M.Sc. on him in 1915.

NOTES ON ELEDONE CIRROSA Lamarck.

By R. RENDALL.

(Read before the Society, December 2nd, 1931).

A LIVE octopus was captured in Kirkwall Harbour on the morning of September 14th, and brought to me for identification. It proved to be a fine specimen of *Eledone cirrosa*, so I immediately transferred it into a large glass tank of salt-water in order to observe its habits when in captivity.

The octopus measured about sixteen inches long from the end of the body to the tip of the tentacles, but so long as the animal remained alive, it was difficult, if not impossible, to obtain exact measurements. When first taken, the octopus was very vivacious, and displayed signs of great activity whenever disturbed. During its transference from the pail in which it was captured to a large bell-glass, the animal violently changed colour, becoming quite pale over the body and along the upper side of the tentacles. When in its new quarters, however, it rapidly assumed its ordinary and more beautiful coat of brownish red, mottled with paler markings.

For two or three hours the octopus was quite willing to exhibit its remarkable powers of propulsion, its swift darting backward flight from one side of the glass to the other being most fascinating to watch. I observed that during the "expulsive" movement the body assumed a torpedo-like shape, one which would offer the least resistance to the water. During the afternoon, however, *Eledone* became more sluggish, preferring to lie on the bottom of the glass, with the posterior end of the body directed toward the light and the tentacles coiled up disc-wise from the tips. The captive octopus rose several times to the surface, and thrust its broad head, crowned with two large prominent eyes, above water. It would then slowly and gracefully creep around the glass, thrusting its webbed tentacles to and fro as it sought a foothold on the sides of the vessel. After a short period of exploration, it generally sank slowly to the bottom, where it resumed its favourite position away from the light.

A curious phenomenon was observed during the afternoon. Small umbellate structures of transparent film were found floating about in the water, ranging in diameter from one-tenth to three-eighths of an inch. These, on examination, were found to be bell-like forms, with a distended umbrella-like mantle underneath. These structures were afterwards explained on a careful examination of the dead octopus, when I found that they corresponded exactly in size and veining with the fleshy suckers on the tentacles.


The octopus was still alive the following morning, but the pulsations were weaker, and only the faintest signs of motion were visible. Rapid movements of spots of colour, however, were observed now and then along the tentacles, and when the animal was transferred to a fresh bucket of salt-water a large quantity of sepia coloured ink was sluggishly and intermittently ejected. The ink gland was evidently exhausted when the animal was taken as during the first twelve hours of its captivity it did not eject any ink when irritated. The whitish rudimentary cirri, which could be observed on the two protuberances above the eyes when the animal was alive, disappeared on death and scarcely a trace of them remained.

This is the second Octopus which has come under my personal notice in Orkney waters. The other was a dead specimen which I found in Kirkwall Bay about 17 years ago. The tentacles of that specimen measured almost 18 inches long, but at that time I was not able to identify the species.

The measurements of the present specimen are: length of body $4\frac{3}{4}$ inches; length of head $1\frac{1}{4}$ inches; length of tentacles (from mouth to tip) from $9\frac{1}{4}$ —12 inches; width of head 2 inches; girth of body 8 inches; diameter of largest sucker $\frac{3}{8}$ inch.

DESCRIPTION OF A NEW CLAUSILIA FROM PAHANG.

By F. F. LAIDLAW, M.A.

*Clausilia orites*¹ n.sp.


SHELL sinistral, solid, elongate, fusiform, purple-brown, finely and evenly striate. Whorls ten, moderately convex, suture simple, well impressed. Aperture auriform, its margins white, peristome well reflected; the upper lamella reaching the margin, the lower not emerging. Palatal plicæ five, the principal long, one millimetre below the suture, the next three equidistant from each other, short, the middle of the three the shortest, whilst the fifth is close below the fourth, and much shorter than it.

Protoconch smooth, whitish, usually much worn.

Alt. 22 mm., lat. max. 5.5 mm., alt. apert. 6 mm., lat. 4 mm.

Seven specimens, Sungei Abu, Cameron's Highlands, 4,500 feet. May 25th, 1931.

The species resembles *C. penangensis* Stol. in appearance, but it is smaller and narrower, and differs in the arrangement of the palatal plicæ.

Type specimen deposited in the British Museum; paratypes to be returned to the Raffles Museum, Singapore, and in my own collection.




Helix aspersa in Orkney,—This snail occurs abundantly in gardens on the west side of Albert Street, Kirkwall, and now and then one may be seen in other gardens in the vicinity. It is unknown in Sutherland, Ross and Caithness, and has no doubt been introduced in Orkney at some time or other, but when and how is not clear. I can say however from my own knowledge that it has been established in these Kirkwall gardens for more than twenty years.—ROBERT RENDALL (*Read before the Society* Sept. 5th, 1931).

1. ὄρειτης = mountaineer.

DESCRIPTION OF A NEW CLAUSILIA FROM PERSIA.

By H. E. J. BIGGS.

(Read before the Society, September 5th, 1931).

Clausilia reshtensis sp. nov.


SHELL sinistral, fusiform, chestnut colour, semi-transparent, somewhat glossy, whorls $11\frac{1}{2}$, imperforate; protoconch consisting of 3 smooth whorls; from 4th to 9th whorl the axial costæ are very distinct and widely separated; the 9th whorl has about 4 costæ to the mm., the 10th whorl about 6; on the last two whorls the costæ are very noticeably finer and closer together; last whorl with a crest at the back of the peristome; this crest is strongly channelled at the base; columella plait deep seated with accessory fold; aperture subcircular; peristome continuous, free, slightly protruding; deep sinus at upper angle; distinct channel at base of aperture; interior reddish.

Alt. 13.3 mm. Max. diam. 3.5 mm.

Habitat. In moss and rubbish under trees near Pir-i-Bazaar, north of Resht, Province of Gilan, Persia.

Type in my collection, paratype in Brit. Mus.

In point of size the type is an average specimen; there is one of the paratypes which measures 11.2 mm. \times 3.6 mm. but this is abnormal and the bottle-shaped general appearance of the shell is rather accentuated. I collected about a dozen specimens altogether.

Note on MSS. of G. C. Hyndman.—It is always well to know where original MSS. are housed, so perhaps a note on the MSS. papers of G. C. Hyndman may be of interest. George Crawford Hyndman was a noted Ulster conchologist who died in 1867. He was a friend of William Thompson, and much of his work was published in the "Natural History of Ireland," vol. 4. He also compiled the three "Reports of the Proceedings of the Belfast Dredging Committee," published in the British Association Reports for 1857, 1858 and 1859. His collection of British shells is now in the Belfast Museum. The manuscripts include 20 dredging lists for Belfast Lough, dated 1844-1857, lists of shells from Carlingford Lough; the Kish Bank, Co. Dublin; Groomsport, Co. Down; Larne, Co. Antrim; Strangford Lough; and the Turbot Bank, Belfast Lough; also the "Report of the Proceedings of the Belfast Dredging Committee for 1857," notes on Belfast Bay Crustacea and 18 autograph letters from prominent naturalists of the day. There is also the original MS. of Professor Wyville Thompson's "Zoophytes recorded from the North of Ireland." The whole collection of papers has now been properly housed, safe from dust and destruction, in the Library of the Belfast Municipal Museum and Art Gallery.—N. FISHER (Read before the Society, Sept. 5th, 1931).

REVISION OF THE SUBFAMILY PEDICULARIINÆ.

By F. A. SCHILDER, Ph. D.

(Read before the Society, September 5th, 1931).

PLATE VI.

THE anatomy of the Pediculariinae proves that they belong to the family¹ Amphiperatidæ (=Ovulidæ). They descended from the subfamily Cyprædiinae (=Eocypræinae), which was widely distributed in the past, especially in Eocene times, but which is represented by only two living species, viz. *Pseudocypræa adamsonii* (Sow.) in the Pacific islands, and *Cypropterina pustulata*² (Sol.) in Western America. The Pediculariinae are adapted to live fixed on various corals, etc.; when young, their shells recall other Cypræacea, being subglobular with both lips inflected and denticulate; later on, they do not change the place chosen on their host, and the shells become cup-like with sharply edged, smooth margins. *Eocypræa inflata mirabilis* Schilder³ from the Eocene of Belgium seems to elucidate the way of that adaptation.

In most species the characters of the shell are rather variable. The general outlines depend on the host to which the animal has been attached; the spire often projects in young specimens of species in which it is entirely concealed by the body-whorl of the adult shell; the colour also seems to correspond to the host; even the number and the strength of the dorsal ribs, and the excavation of the columellar sulcus are variable between certain limits. Notwithstanding all shells can easily be determined by the sum of their characters, though often one or other character does not agree with the usual features of the species.

Besides *Cypræogemmula liliputana* Schilder from the Oligocene of Germany, which connects *Cypropterina* with *Pediculariella*, there are at least two genera; *Pediculariella* (genotype: *californica*) has a radula very similar to living Cyprædiinae, while in *Pedicularia* (genotype: *sicula*) there is a small accessory third lateral plait, which has never been observed in any other group of Cypræacea. If Macdonald's drawing of the radula of *Pedicularia stylasteris* is correct, a third recent genus should be erected for the Indopacific species, in which the first lateral plait is not flabellate, but simply cusp-like as it is in Eratoidæ (=Triviidæ). The shells of these groups show no satisfying character, so that the diagnosis:

¹ The generic name Amphiperas undoubtedly has priority: Meuschen's Index to the third volume of Gronow's Zoophylacium (1781) is strictly binary; the Opinion 89 of the International Commission of Zoological Nomenclature evidently rejects the first and second volumes (1763) only.

² There is no reason to reject the Portland Catalogue (1786) for new names accompanied by a description or quotation of published figures; Mr. R. Winckworth shares that view.

³ Bull. Mus. Hist. Nat. Belgique, vol. 7, part 14, p. 9 (1931).

Columella distinctly excavate, inner margin carinate. Pediculariella.

Columellar sulcus obsolete or nearly so . . . Pedicularia.
must be regarded as provisional only.

The eleven known species (two of which are new) can be distinguished as follows :

Species Habitat	Usual length (and extremes) in mm.	General outlines.	Spire in adult shells.	Colour usually	Radial dorsal ribs. 1	Columellar sulcus.
<i>pacifica</i> , Pacific.	4—5 (3½—8)	ovate, rather irregular.	visible. 2	pink to purple (orange).	strong, alternate, decussate.	distinctly excavate.
<i>dautzenbergi</i> , Celebes. 3	2½—3	subconical (dorsum sub- carinate).	visible.	yellowish to pinkish.	fine, not decussate.	deeply excavate inner margin crenulate.
<i>californica</i> , California.	8—10 (5—14)	oblong, mostly regular.	concealed.	lively pink 4	fine, undulate.	mostly distinct, straight.
<i>decussata</i> , Antilles	(6—13)	oblong.	visible.	white to pale pink.	rather fine, undulate.	probably excavate.
<i>stylasteris</i> , Pacific.	5—6 (3—6½)	oblong to semilunar, irregular.	visible.	purple, rarely pink.	very fine and numerous.	obsolete to hardly excavate. 5
<i>elegantissima</i> , Indic.	4½—5½ (4—6)	ovate, mostly regular.	hardly visible.	purple to pink.	very fine, decussate.	shallow to obsolete.
<i>subtilis</i> , Indic. 6	3½—4	semi- circular.	concealed.	white to flesh colour.	obsolete, only concentri- cal striæ distinct.	indistinct.
<i>japonica</i> , Japan.	13	oblong, humped.	visible, umbilicate.	white, suffused with purple.	rather coarse.	indistinct.
<i>deshayesiana</i> , Pliocene: Sicily.	5	oblong, subregular.	slightly visible.	unknown.	rather fine, not decussate.	obsolete.
<i>sicula</i> , Mediterr- anean.	6—8 (4½—10)	ovate to irregular.	concealed.	white or pinkish. 7	coarse, alternate, often decussate. 8	wanting to hardly depressed.
<i>decurvata</i> , Azores.	8	very irregular.	concealed.	white.	wanting, only con- centrical striæ visible.	probably obsolete.

Synonymy and distribution:

Subfamily PEDICULARIINÆ

Stoliczka (1867) Palæont. Indica, ser. 5, vol. 2, p. 45 (em.); Thiele (1925) in Kükenenthal, Handbuch d. Zoolog., vol. 5, p. 88; Schilder (1927) Archiv Naturg., vol. 91, part A.10, p. 65; Thiele (1929) Handbuch syst. Weichtierkunde, p. 269.

=PEDICULARIADÆ Gray (1857) Guide Moll. Brit. Mus., vol. 1, p. 74.

=PEDICULARIACEA Troschel (1863) Gebiss d. Schnecken, vol. 1, p. 187.

=PEDICULARIIDÆ Tryon (1885) Manual Conch., vol. 7, p. 241; Kobelt (1906) Iconograph. europ. Meeresconch., vol. 4, p. 30.

Scattered over all warm seas; Pliocene to recent.

Genus *Pediculariella*.

Thiele (1925) loc. cit. p. 88; Thiele (1929) loc. cit. p. 270. Eastern Pacific and America.

1. *P. pacifica* Pease (1865) Proc. Zool. Soc. London, p. 516. Savage Isl., New Caledonia, Marshall Isls.; Sandwich Isls.? (see below).
2. *P. dautzenbergi* nov. sp. Celebes.
3. *P. californica* Newcomb (1864) Proc. Calif. Acad. Sci., vol. 3,

1 In the centre of the dorsum, the space of one mm. contains about 5 radial ribs in *sicula*, about 6 in *pacifica*, 8 to 9 in *californica*, and about 10 in *dautzenbergi* and *elegantissima*. In the margins, especially on the right side, the ribs are never alternately coarse, but always equally fine, relatively more numerous, and sometimes even obsolete.

2 It is concealed in two specimens from the Marshall Isles (Mus. Vienna).

3 Two specimens from "Celebes, on sand" in coll. Dautzenberg: (a) 2.3×1.5 mm., young, yellow, spire large, projecting, orange (this colour can also be observed in *pacifica*), with 13 long labial teeth, 1+7 columellar teeth, and 7 denticles on the inner margin of the columellar sulcus; (b) 2.9×1.9 mm., adult, rather calcified, probably pinkish yellow, spire shorter, shell's outline deltoidal, outer lip broken, inner lip even, columellar sulcus with 4 denticles interiorly.

4 Larger shells are rather callous; there are whitish to yellowish callous deposits especially on the margins of such shells.

5 Hedley's figure proves that the denticles do not serrate the inner margin of the columellar sulcus, but they correspond to the real columellar teeth of young shells; or possibly there are no teeth at all, but the radial ribs of the body whorl often visible in the centre of the columella, have been regarded as teeth by Hedley.

6 Two specimens from "Bourbon" in the writer's coll. (No. 484/485, bought from H. C. Fulton who possessed many quite similar shells); (a) 3.4×2.4 mm., extremely thin, pellucid, white; (b) 4.2×2.6 mm., pellucid, dorsum pale pinkish flesh colour, margins white; in both specimens the extremely fine and numerous radial ribs are practically obsolete, so that the close, concentric lines form the only visible structure.

7 In some shells, the columella or the centre of the dorsum is pinkish, or the entire shell is yellowish or even greenish yellow; in one specimen (coll. Jousseaume) there are concentric yellow and pink zones alternate as in some species of *Tellina*, etc.

8 In rare specimens there are finer ribs only (coll. Jousseaume), as shown in the figure of *paradoxa* (Phil.)

p. 121; vol. 4, p. 322, pl. 1. fig. 9; Keep (1904) West American shells, p. 207, fig. 221. Farallone Isl. to San Diego, especially in the Monterey Bay.

4. *P. decussata* Gould (1855) Proc. Boston Soc., p. 127; Dall (1889) Bull. Mus. Compar. Zool., p. 237, pl. 19, fig. 9; Kobelt (1906) loc. cit., p. 32, pl. 106, figs. 9, 10.

=*albida* Dall (1881) Bull. Mus. Compar. Zool. vol. 9, p. 39. Georgia to Barbados.

Genus **Pedicularia**.

Swainson (1840) Treatise on Malac., p. 244, 357; all writers cited sub Pediculariinae above.

=*Thyreus Philippi* (1844) Enumer. Moll. Siciliae, vol. 2, p. 92 (name preoccupied). Western Pacific, Indic, Europe.

1. *P. stylasteris* Hedley (1903) Mem. Austral. Mus., vol. 4, part 1, p. 342, figs. 69-70.

=sp. Macdonald (1856) Trans. Linn. Soc. London, vol. 22, p. 241, pl. 42, figs. 7, 8. N. S. Wales, Elizabeth Reef, Kingsmill and Marshall Isls.

2. *P. elegantissima* Deshayes (1863) in Maillard, Notes île de la Réunion, Append. E, p. 50, pl. 6, figs. 23-26.

=*liénardi* Robillard (1871) Trans. Roy. Soc. Mauritius, vol. 5. Réunion, Mauritius, Seychelles.

3. *P. subtilis* nov. sp. Réunion.

4. *P. japonica* Dall (1871) Amer. Journ. Conch., vol. 7, p. 121, pl. 16, fig. 12. Nippon.

5. *P. deshayesiana* Seguenza (1865) Journ. de Conchyl., ser. 3, vol. 5, p. 58, pl. 4, fig. 1. Pliocene of Messina.

6. *P. sacula* Swainson (1840) loc. cit., p. 245, fig. 44; Lovén (1847) Ur Oefvers. Kong. Vet. Akad. Förh. 9 Juni, 1847, p. 193, pl. 4; Troschel (1863) loc. cit. p. 189, pl. 16, fig. 6; Locard (1892) Coqu. mar. côtes France, p. 34, fig. 20; Kobelt (1906) loc. cit., p. 30, pl. 106, figs. 7, 8, 11, 12; Hidalgo (1917) Fauna malac. España, part 2, p. 543; Thiele (1929) loc. cit., p. 269, fig. 284.

=*Calyptræa* sp. Costa (1839) Corrispond. Zoolog., 8vo, p. 25.

=*Thyreus paradoxus* Philippi (1844) loc. cit., p. 92, pl. 18, f. 11.

=*Calyptræa polymorpha* Calcara (1845) Cenno. Moll. viv. foss. Sicilia.

= *Gadinia lateralis* Requier (1848) Cat. Coqu. Corse, p. 32.
Northern shores of the Western Mediterranean Sea (Spain, Corsica, chiefly Sicily), Portugal?

7. *P. decurvata* Locard (1897) Expéd. scient. Travailleuse et Talisman, Moll., vol. 1, p. 96, pl. 3, figs. 12-15; Kobelt (1906) loc. cit., p. 33, pl. 107, figs. 1-3.

? = *sicula* Dautzenberg (1889) Rés. camp. Scient. Monaco, vol. 1, p. 39, pl. 4, figs. 1-2. Azores.

NOTE.—*Dentiora rubida* Pease (1862) Proc. Zool. Soc. London, p. 240 seems to be a young shell of *Pediculariella pacifica*; if this synonymy should be proved, *Pediculariella* would become a synonym of *Dentiora*, and *pacifica* a synonym of *rubida*. *Crithe atomaria* Gould (1860) Proc. Boston Soc. Nat. Hist., vol. 7, p. 383 and *Coralliobia fimbriata* Adams (1854) Ann. Mag. Nat. Hist., ser. 2, vol. 14, p. 17 must be excluded from Pediculariinae: the former, the unique specimen of which has been destroyed, remains doubtful, but evidently it cannot be regarded as a young *Pediculariella* cf. *dautzenbergi*; *Coralliobia* has been placed in the Stenoglossa by Thiele (1929) loc. cit. p. 301.

EXPLANATION OF THE FIGURES ON PLATE VI.

1. *Pediculariella pacifica* (5 mm. long, dorsal view, writer's coll.).
2. *P. californica* (5.4 mm. long, basal view, young shell, showing an abnormal double row of labial teeth, and some columellar teeth, coll. Dautzenberg).
3. *P. dautzenbergi* (a: 2.9 mm. adult, incomplete; b: 2.3 mm. young; both basal view, coll. Dautzenberg).
4. *Pedicularia subtilis* (3.4 mm., a: basal view; b: dorsal view, writer's coll.).

OBITUARY NOTICE: OLE NORDGAARD.

By H. SCHLESCH.

(Read before the Society, December 2nd, 1931).

At an age of nearly 69 years, died September 3rd, 1931, after a few months' illness in the hospital at Trondheim, Norway, Ole Nordgaard, the Director of the Biological Station at Trondheim Fjord and Curator of the Trondheim Museum. Nordgaard was born 8th November, 1862 at Tømmeraas, Grong, in Trøndelag, and after having finished his University education in 1890 he was a teacher for some years, until in 1895 he was appointed Superintendent of the Bergen Biological Station just opened. When the Biological Station at Trondheim Fjord was started in 1906 Nordgaard accepted employment as its Director and his reputation as marine biologist has become well-known during the last quarter of a century.

Nordgaard published a great number of valuable papers in Ichthyology, Malacology and other parts of Zoology, but his special territory was the Bryozoa of the Arctic seas. Nordgaard was a born scientist and his reputation as one of the most prominent workers will live for many years to come. But besides this Nordgaard was of a very social nature and will be missed by his many friends.

Nordgaard was unmarried. The funeral took place from the cathedral at Trondheim, September 8th, 1931, but his remains were buried in the Churchyard of Stod where he had spent his childhood. Nordgaard's extensive library will pass to the Royal Norwegian Scientific Society at Trondheim. He had been a member of the Conchological Society since 1919.



Mollusca of Wicken Fen.—In the "Natural History of Wicken Fen," part 2, April, 1925, pp. 154-161, Mr. H. H. Brindley enumerates thirty-one species of mollusca "which have been taken in the living state or as obviously fresh shells in Wicken Fen during recent years," to which Mr. Charles Oldham adds a further twenty species on pp. 198-200 of the same work (April, 1926). To the species already recorded *Valvata macrostoma* Mörch and *Planorbis crista* (Linné) have now been added, bringing the total up to fifty-three—A. E. ELLIS (Read before the Society, Sept. 5th, 1931).

FURTHER OBSERVATIONS ON THE SIZE OF *UROSALPINX CINEREA* Say.

By H. FEDERIGHI.

(Read before the Society, September 5th, 1931).

IN a previous note (Federighi, 1930) certain relationships existing between the length of the shell of *Urosalpinx cinerea* and the environmental salinity were indicated which favoured the view that perhaps this animal had an optimum salinity, and that a lowering or raising of this might bring about dwarfing (Vernon, 1903; Metcalf, 1904; 1930). Since the publication of this note I have been able to obtain about 1,000 animals from Quisset Harbor, near Woods Hole, Massachusetts. These I have measured and in the following paragraphs are given the results which include observations on the average length of the shell of both males and females; the relation between length and sex; between width and sex; and the frequency of each sex.

The methods used in collecting these data are indicated in figure 1. Vernier calipers were employed to measure the width and length. Although there are no external characteristics by which the sexes can be separated, the males are easily distinguished by a large curved penis which lies at the right side of the head behind the eyes.

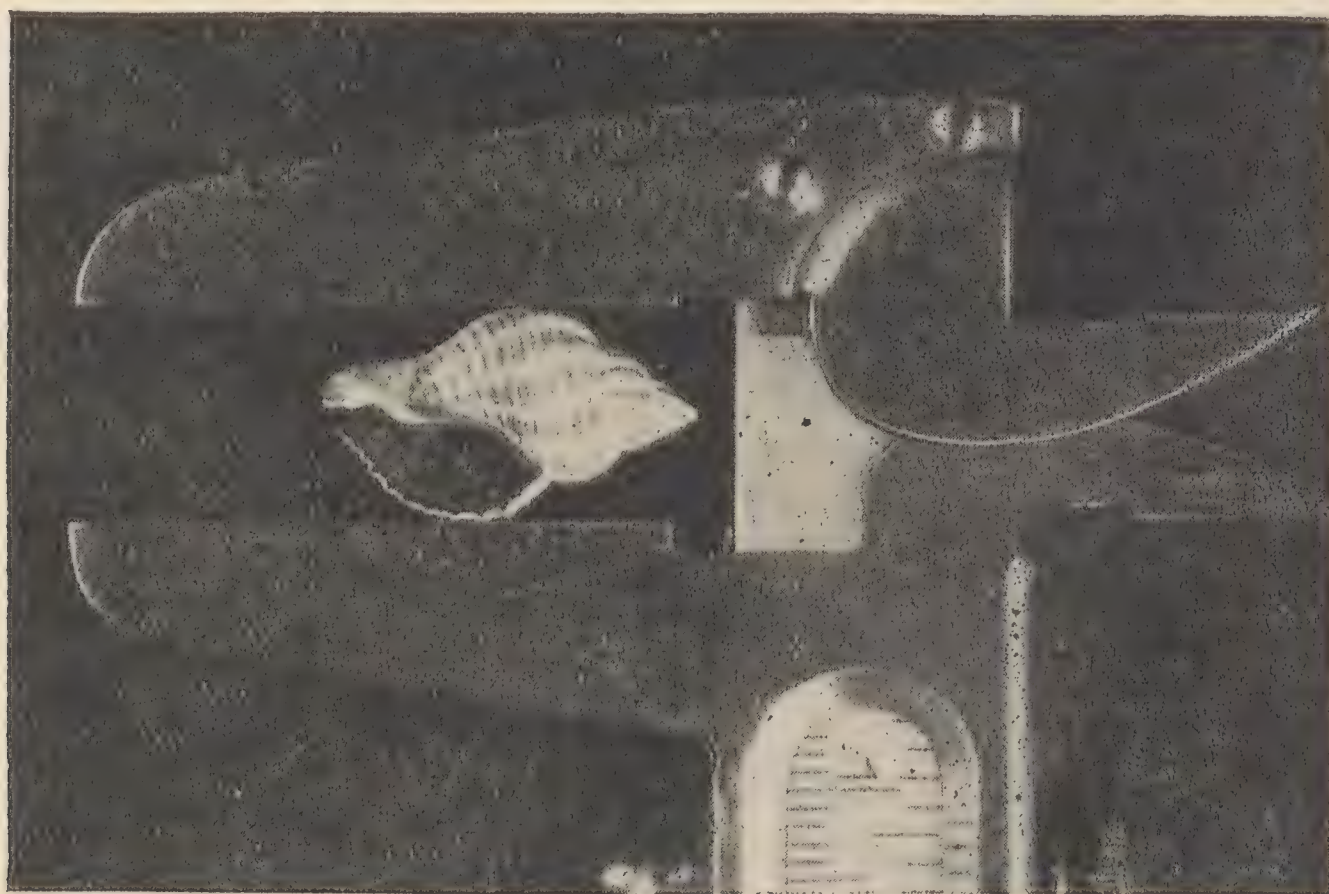


Figure 1a.

In figure 2 are given the data on the length and frequency of 1136 shells from which it is easily seen that the average length for males and females is very close to 21 mm., a figure identical with that obtained by Walters (1910). The average size of *U. cinerea* will be

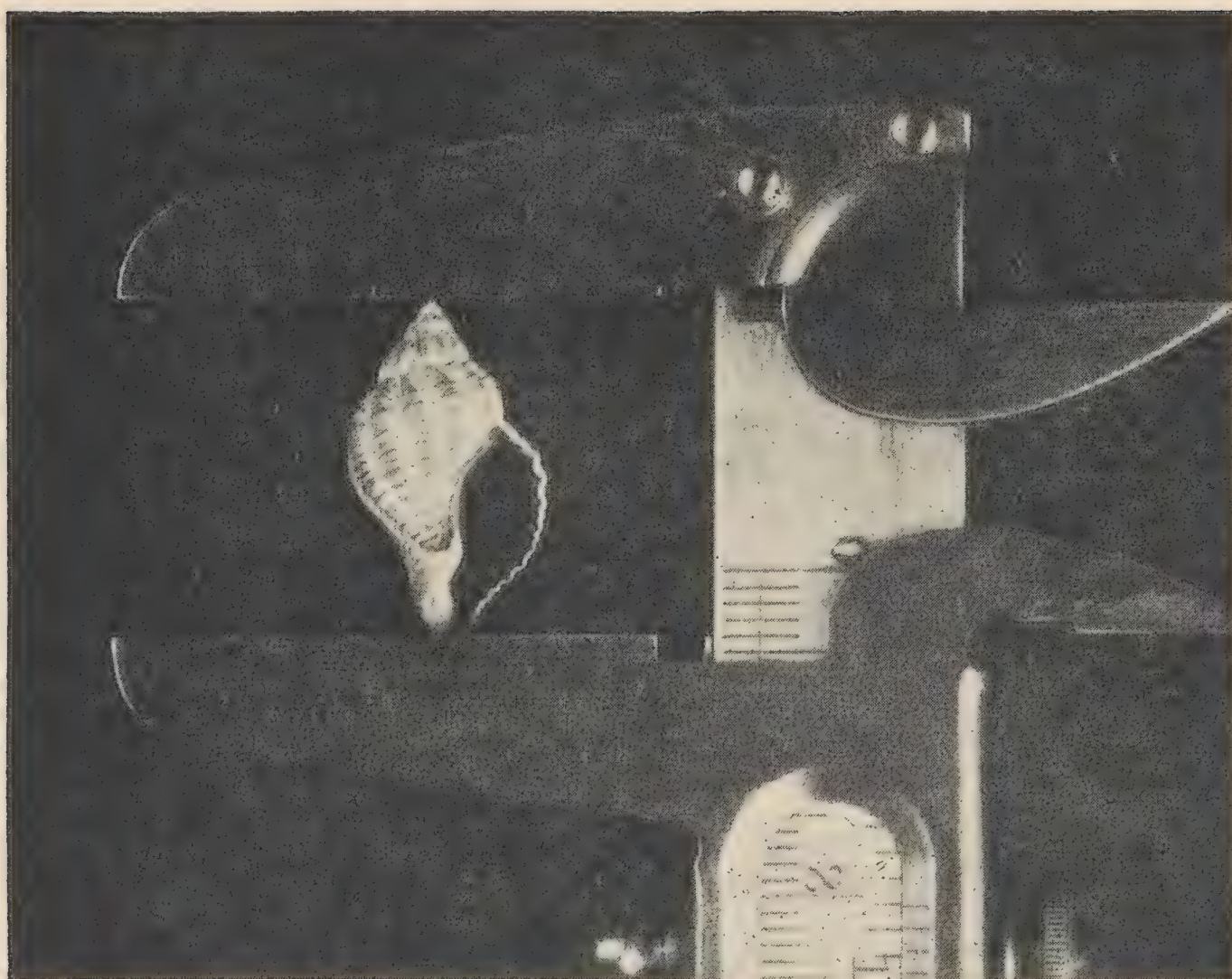


Figure 1b.

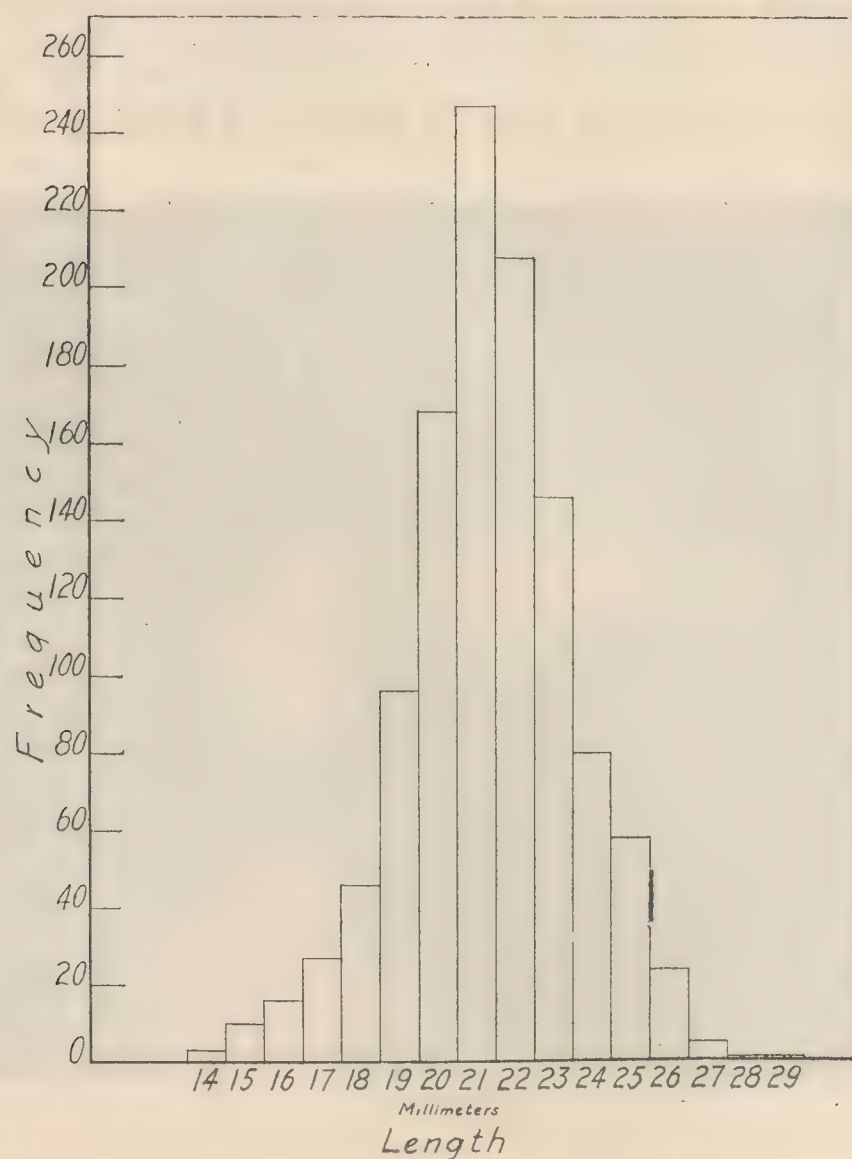


Figure 2

influenced very markedly by the number and size of the females in any given population, since it is usually assumed that the female gastropod is larger than the male (Cooke, 1895). If this is true it

was important to know the number and size of females present because the average size obtained in figure 2 would be greatly influenced by the presence of a large number of females. This was easily done and the results are given in figures 3 and 4. A study of these curves

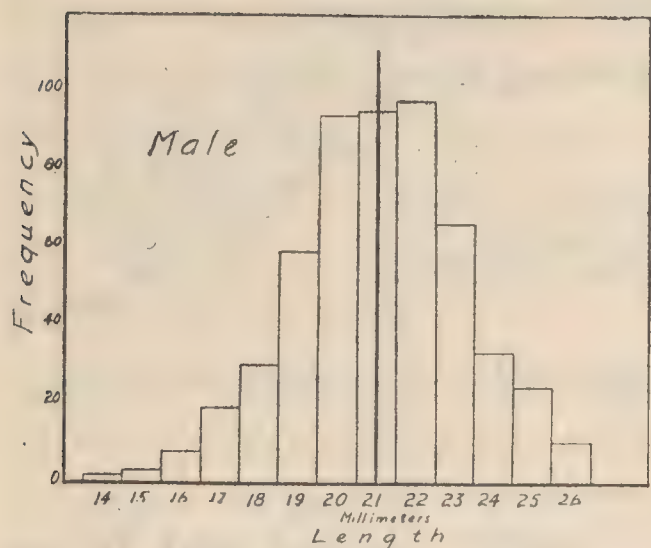


Figure 3.

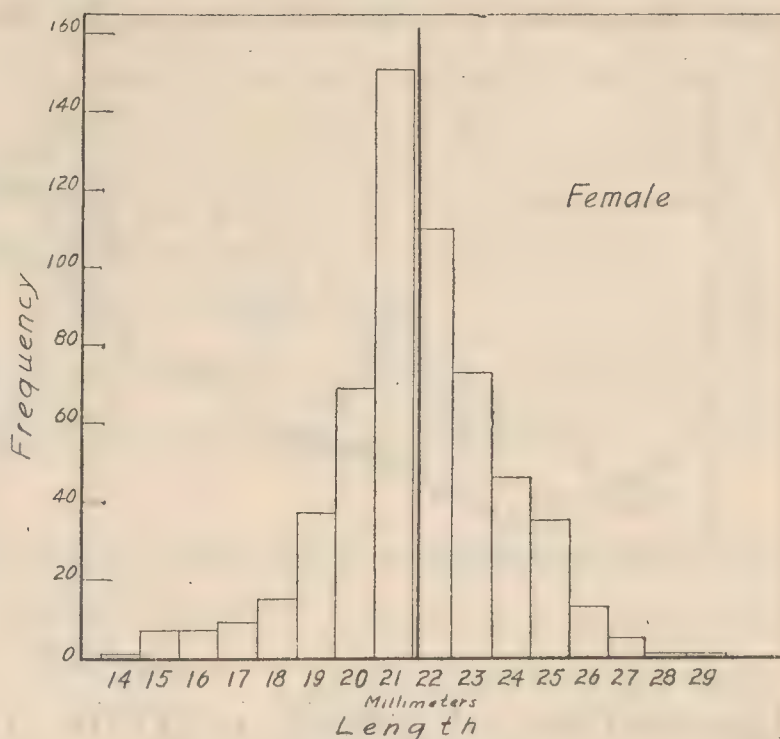


Figure 4.

shows that out of a total of 1121 animals in which the sex was determined 541 were males and 580 were females, a ratio of almost 1:1; that the average length for males was 21 mm.; for females, 21.6 mm.; that the greatest number of males is grouped in the 20, 21 and 22 mm. classes (the number of these classes is almost equal) and the largest male is only 26 mm. long; and finally that the number of females having a length of 21 mm. is very high and the largest female is 29 mm. Thus, although the average size of males and females is fairly close, the frequency of the various sizes is different. It cannot be said, therefore, that females are larger than males, but this can be said, females reach a larger size than males. One other series of observations was made. In figure 5 are given the average widths of

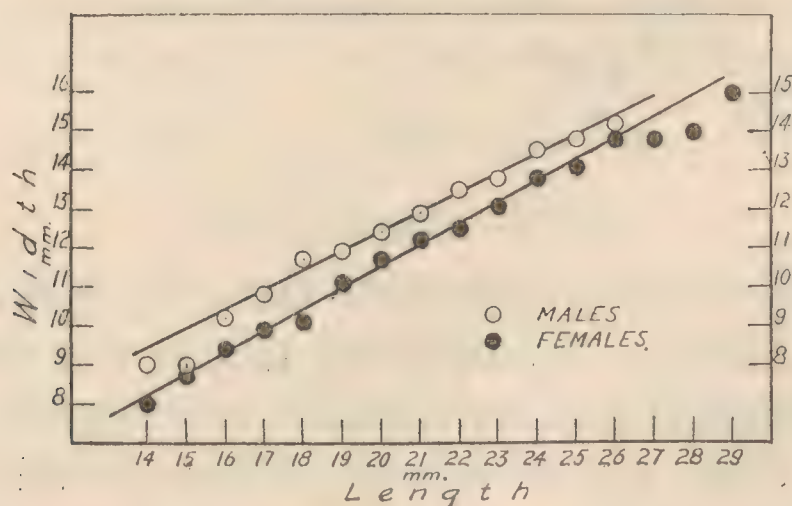


Figure 5.

males and of females at the same lengths. It is apparent that the slope of the two lines is different, the curve for males being somewhat flatter. This indicates that females are slightly wider than males, a

fact which might be accounted for by the capsule-laying habits of this species, and the fact that the ovaries are usually larger than the male gonads.

How do these results tie up with the data collected from Norfolk and Beaufort (Federighi, 1930)? In figure 6 are shown the water

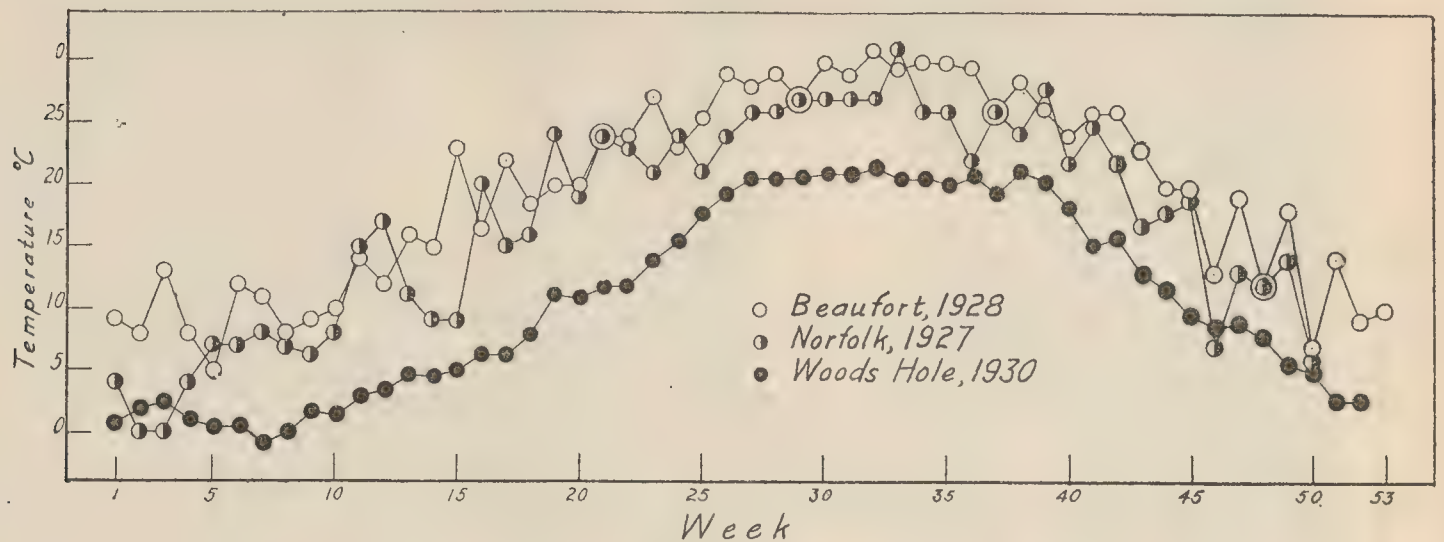


Figure 6.

temperatures at weekly intervals at Beaufort, Norfolk and Woods Hole. It is apparent that the average temperature for the Woods Hole region is approximately 5° - 7° C. lower than that at the other two localities. Furthermore, figure 7 shows that at Beaufort the salinity

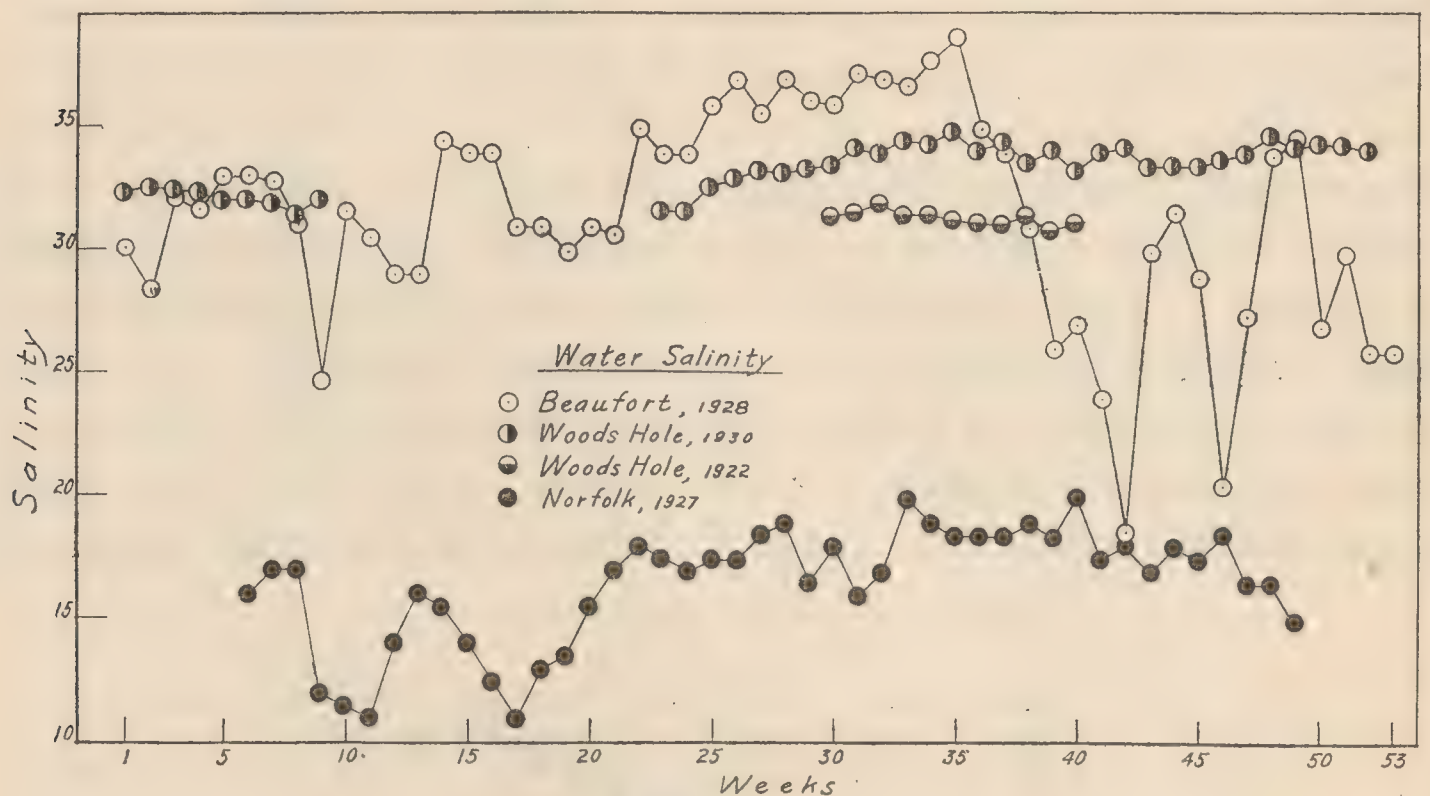


Figure 7.

is approximately 10 parts per mille higher than at Norfolk and that that at Woods Hole is slightly lower (about 2-3 parts) than that at Beaufort. Because of the small amount of fresh water which empties into Buzzards Bay the salinity at Woods Hole is very uniform throughout the year. The slight persistent rise during late spring shown in figure 7 may be due to the unusually dry summer of 1930.

Several conclusions can be drawn from these data. The lower temperatures obtaining at Woods Hole would tend to make the

animals grow to a larger size (Hubbs, 1926) than those at Beaufort or at Norfolk, while the salinity (only slightly lower than that at Beaufort and much higher than that at Norfolk) would tend to make the individuals considerably smaller than at Norfolk but slightly larger than those at Beaufort. Since, however, we have no quantitative data on the effects of temperature on size, it is very difficult to predict what the size of the Woods Hole drills should be. The result depends necessarily on the optimum temperature and salinity which are still undetermined and which indeed may vary (Federighi, 1931) for this species. We find from the observations, above, that the average size (21 mm.) for the Woods Hole animals is smaller than the animals at Hampton Roads (23 mm.) but larger than the Beaufort shells (15 mm.).

In this regard it is interesting to give the observations of Fraser (private communication) who found that *U. cinerea* Say in England averaged 29-30 mm. in length at a salinity of 34-34.53 parts per mille, while Nelson (1931) gives 28.8 mm. as the average length for drills collected from Maurice River Cove, Delaware Bay where the salinity averaged from 21.38 to 29.7 parts per mille between September, 1930 and May, 1931 (private communication). What factors have influenced the size of these shells is problematical.

SUMMARY.

Urosalpinx cinerea from Woods Hole, Massachusetts, where the salinity averages approximately 30-32 parts per mille, give an average length of 21 mm. for 1136 individuals. Although the average size for females is only slightly larger (21.6 mm.) than for males (21.0) there are more females in the larger classes. Females are wider than males—a result probably due to the capsule-laying habits of the species. The relationship between sexes is approximately 1:1. The relation of size to temperature and salinity is discussed.

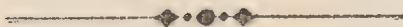
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EXPLANATION OF THE FIGURES.

- Figure 1. Photograph showing method of measuring shells.
- Figure 2. Curve showing the frequency of the size groups of *U. cinerea* from Woods Hole.
- Figure 3. Curve showing the frequency of the size groups of male *U. cinerea* from Woods Hole.
- Figure 4. Curve showing the frequency of the size groups of female *U. cinerea* from Woods Hole.
- Figure 5. Curves giving the relationship between width and length of male and female *U. cinerea* from Woods Hole.
- Figure 6. Graph showing water temperatures at weekly intervals at Beaufort, Norfolk and Woods Hole. The latter were obtained from Mr. Hoffses, Superintendent of the Woods Hole Fisheries Station.
- Figure 7. Graph giving salinities at weekly intervals at Beaufort, Norfolk and Woods Hole. The 1922 Woods Hole records are from Fish (1925); Those for 1930 were obtained from Mr. Hoffses, Superintendent of the Woods Hole Fisheries Station.



NOTES ON SOME NORFOLK MOLLUSCA.

By A. E. ELLIS.

(Read before the Society, December 2nd, 1931).

Valvata macrostoma (Steenbuch MS.) Mörch.—Small numbers of this species were found in August, 1931, in drains at Bradeston Marsh, near Brundall, East Norfolk, amongst *Glyceria aquatica*, *Nasturtium officinale*, *Hydrocharis morsus-ranæ*, *Sium erectum*, *Lemna minor*, *L. gibba*, *L. polyrrhiza*, *Elodea canadensis*, *Ceratophyllum demersum*, *Callitriche* and sedges. The associated mollusca were *Valvata cristata* Müller, *Bithynia tentaculata* (L.), *B. leachii* (Sheppard), *Lymnæa pereger* (Müller), *Physa fontinalis* (L.), *Planorbis corneus* (L.), *P. planorbis* (L.), *P. vortex* (L.), *P. vorticulus* Troschel, *P. contortus* (L.), *P. complanatus* (L.) [=fontanus Lightfoot], *Segmentina nitida* (Müller), *Sphærium corneum* (L.) and *S. lacustre* (Müller). Numbers of the true *Succinea elegans* Risso (not *pfeifferi*) were crawling on the Frogbit, together with a few *S. putris* (L.).

Planorbis vorticulus Troschel.—This species, which Mr. Kennard has previously recorded from the neighbourhood of Whittingham railway station, near Norwich, was found in fair quantity in September, 1931, in a marsh drain at Postwick, East Norfolk, in company with *Valvata piscinalis* (Müller), *V. cristata*, *Bithynia tentaculata*, *B. leachii*, *Lymnæa palustris* (Müller), *L. stagnalis* (L.), *L. pereger*, *Physa fontinalis*, *Planorbis corneus*, *P. planorbis*, *P. carinatus* Müller, *P. vortex*, *P. contortus*, *P. complanatus*, *Segmentina nitida*, *Viviparus fasciatus* (Müller) and *Sphærium corneum*. The vegetation of this dyke comprised *Fontinalis antipyretica*, *Hydrocharis morsus-ranæ*, *Nasturtium officinale*, *Oenanthe fistulosa*, *Elodea canadensis*, *Lemna minor*, *L. trisulca*, *Hottonia palustris*, *Ceratophyllum demersum* and *Callitriche*. Although search was made in numerous other drains in this region, no further locus for *P. vorticulus* was discovered, but a more extensive investigation of the Yare marshes would probably show it to be more widely distributed than this would indicate.

Arion subfuscus (Draparnaud).—Immature specimens of this slug were found in April, 1931, amongst *Mercurialis perennis* in Furze Covert, Hargham, West Norfolk, associated with *Arion ater* (L.), *A. circumscriptus* Johnston, *Euconulus fulvus* (Müller) and *Oxychilus alliarius* (Miller). This wood consists principally of oak, beech, birch, alder, hazel and elder, with a ground flora of nettles and *Rubus*. In August, 1931, a further locality for *A. subfuscus* in West Norfolk was discovered, namely Wayland Wood (oak-hazel) near Watton, where the slug was found feeding on *Lactarius trivialis*, and it was

also found in a mixed wood at Old Buckenham in East Norfolk. The Old Buckenham wood consists chiefly of beech, with pedunculate oak, birch, sycamore, sweet chestnut, firs, rowan, holly, hazel, privet, rhododendron, elder, box and cherry laurel, with a ground flora of ivy, brambles, nettle, bracken and honeysuckle. The other mollusca found in this wood were *Carychium minimum* Müller, *Lauria cylindracea* (Da Costa), *Cochlicopa lubrica* (Müller), *Marpessa laminata* (Montagu), *Arion hortensis* Férussac, *A. intermedius* (Normand), *Euconulus fulvus*, *Retinella pura* (Alder), *R. nitidula* (Draparnaud), *Oxychilus alliarium*, *O. cellarium* (Müller) and *Limax marginatus* Müller [= *arborum* Bouchard-Chantereaux]. *Arion subfuscus* and *A. intermedius* were noticed feeding on the fungi *Lactarius serifulus*, *Amanita aspera*, *Russula fæstens*, *R. integra* and *R. fellea*, the last named being an especial favourite with young *A. subfuscus*. *Arion intermedius* was also found on *Russula emetica*, *R. nigricans*, *Amanita phalloides*, *Amanitopsis fulva*, *Paxillus involutus*, *Lactarius aurantiacus* and *Hypholoma fasciculare*. *Oxychilus alliarium* occurred on *Russula integra* and *Amanitopsis fulva*; and *O. cellarium* on *Russula ochroleuca*. In Sept., 1931, *Arion subfuscus* was observed in a mixed wood at Scoulton, West Norfolk, composed of beech, pedunculate oak, birch, Scots pine, spruce, sycamore, hazel, alder and rhododendron, with practically no ground flora except mosses. The associated mollusca included *Lauria cylindracea*, *Arion intermedius*, *A. ater*, *Oxychilus alliarium*, *Vitrea crystallina* (Müller) and *Vitrina pellucida* (Müller). *Arion subfuscus* occurred on *Thelephora laciniata* and *Tricholoma acerbum*, and together with *A. intermedius* on *Amanitopsis fulva*, *Hypholoma fasciculare* and *Lactarius rufus*. *A. intermedius* also occurred on *Russula fellea*, *R. rubra*, *R. emetica*, *Amanita pantherina*, *Paxillus atrotomentosus*, *P. involutus*, *Lactarius torminosus*, *Hypholoma hydrophilum*, *Clitocybe splendens* and on a fallen acorn cup, which it was devouring. *A. ater* was found on *Lactarius torminosus*, and *Oxychilus alliarium* on *Paxillus atrotomentosus*, *Hypholoma hydrophilum*, *H. fasciculare*, *Polyporus giganteus* and *Clitocybe splendens*. I am indebted to my sister (E.M.E.) for the identification of the fungi on which these mollusca were feeding.

NOTE ON VIVIPARUS CONTECTUS (Millet).

BY CHARLES OLDHAM.

(Read before the Society, December 2nd, 1931).

OUR ignorance of the duration of life of even our commonest snails is so great that any contribution, however meagre, to our knowledge of the subject is likely to be of interest. In May, 1925, I collected in a fen-drain at Burwell, Cambs. examples of *V. conlectus* which included several with shells of a uniform dark purple colour, a form described by Mr. F. Taylor in 1904 as the var. *atro-purpurea*, from specimens taken in the nearby Wicken Fen (*Journal of Conchology*, xi, p. 144). One of these produced several young ones in June. Whether any of these had a banded shell I cannot say, but one, which I isolated within a few days of its birth, in a large bell-jar, where it spent the rest of its life, had, like its female parent, a bandless, dark purple shell. By Nov. 1929, the shell measured 33.6 mm. long, but it did not grow thereafter, although it lived until Mar. 28th, 1931. Its death at an age of approximately 5 years 9 months was probably not due to senility but to some untoward circumstance, for in cleaning it I found in the body a number of embryos, including thirteen which seemed nearly ready for reclusion.

In August, 1928 I had placed in the bell-jar a male, born on Mar. 20th, 1927, of parents obtained from a London aquarist. These were quite unlike the Burwell snail, in that the shells were greenish yellow in colour with three well-marked bands, and the animals, instead of being dark purplish brown with golden flecks, were, with the exception of the golden flecks—a normal character—virtually colourless. This male is still (October 1st, 1931) alive, 4 years and 6 months of age, and with a length of 20.2 mm. is apparently full-grown; it had already attained a length of 20.7 mm. on Nov. 10th, 1929. A female born on July 20th, 1926, which was used in another experiment, had attained a length of 28.2 mm. by November 9th, 1929. When it died at the age of 4 years 11 months it had only added another 3 mm. A *coitus* of the purple shelled female and the greenish yellow male was observed on March 10th, 1930 and another on August 19th, 1930, and no doubt pairing took place on other occasions and passed unnoticed. A single young one was born on April 3rd, 1930. It had a distinctly three-banded shell, like the male parent, and its body, pale at first, was, at the time of its untimely death in January, 1931, and for some time previously, purplish like that of the female. It was then 10.3 mm. long. At birth its tentacles looked alike, but on Aug. 24th, 1930, at 4 months, 3 weeks—and possibly earlier—the attribute of the male, a thickened right tentacle, was obvious.

My purpose in rearing and uniting two snails of different shell and body colour was to ascertain, if possible, how these characters behaved in inheritance, but it was frustrated by the death of the female. The fact that the shells of all of the thirteen embryos found in the body after death were, like that of the single young snail born in April, 1930, distinctly banded, although insufficient to base a definite conclusion upon, suggests that the yellowish, banded colouration is dominant to the uniform purple; whilst the dark body colour, apparent at the age of 5 months, suggests that dark (i.e. normal) body colour is dominant to the pale, almost colourless, condition.

Life-history of *Myxas glutinosa* (Müll.)—In Chislet Marshes (East Kent) this year the egg capsules were found towards the end of May. They were oblong ribbon-shaped with about 20 embryos, arranged in two regular rows. In size they averaged 15×4 mm., which is smaller than French examples. Moquin-Tandon gives $15-20 \times 4-5$ mm. as dimensions, and 30 to 40 embryos. Young shells were to be seen by mid-June, when the old shells were dying off fast. Those still alive had the surface of the shell eroded in lines and patches. By the end of June the old shells were almost all dead. On July 24th young shells were seen nearly half-grown and on Sept. 30th some appeared to be mature. Various authors have commented on the disappearance of *Myxas* from time to time. This seems to be partially explained by the death of the older generation in June. As noted above the new brood is small and easily overlooked until August. Moquin-Tandon says that this species lives "at the roots of duckweed." Gray's edition of Turton gives "on roots of duckmeat." So far as my observations go *Myxas* avoids those parts of the ditches filled with *Lemna trisulca*, the Ivyleaved Duckweed. It is usually to be found on weeds at the bottom of ditches where the vegetation allows plenty of light to reach it.—J. E. COOPER (*Read before the Society*, Dec. 2nd, 1931).

H. obvoluta near Amberley.—Mr. A. G. Stubbs has shown me some specimens of *Helicodonta obvoluta* which he recently collected at Bury Hill near Amberley. This must be the most easterly recorded and authenticated locality for the species as Spring Head has never been confirmed and may, as at Cissbury, refer to fossil shells.—J. GORDON DALGLIESH (*Read before the Society*, Sept. 5th, 1931).

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN & IRELAND.

592nd Meeting, held at the Manchester Museum, September 5th, 1931.

Mr. G. C. Spence in the chair.

Additions to Library and Cabinet announced and Thanks Voted.

See reference to these in the Annual Report.

Candidates Proposed for Membership.

A. R. Waterston, 113, Marchmont Road, Edinburgh (introduced by C. Oldham and A. E. Boycott).

Resignation.

L. B. Jump.

Members Deceased.

J. Williams Vaughan, F. Rhodes, Greevz Fysher, J. W. Taylor and Miss A. L. Massy.

Votes of Condolence were passed.

Papers Read.

"Note on MSS. of G. C. Hyndman," by Nora Fisher.

"Further Localities for *Planorbis vorticulus* Troschel," by A. E. Ellis.

"*Helicodonta obvoluta* near Amberley," by J. G. Dalglish.

"The Land and Freshwater Mollusca of Sussex," by J. G. Dalglish.

"Description of a supposed new species of *Clausilia* from Persia," by Rev. H. E. J. Biggs.

"*Helix aspersa* in Orkney," by Robert Rendall.

"Mollusca of Wicken Fen," by A. E. Ellis.

"Revision of the Subfamily Pediculariinae," by F. A. Schilder, Ph.D.

"Further Observations on the size of *Urosalpinx cinerea* Say," by H. Federighi.

Exhibits.

By Mrs. Morehouse:—Varieties of *Helix pisana* from Tenby; of *H. nemoralis* from Doncaster; and of *H. hortensis* from Bramham cross-roads near Leeds; also *H. aspersa* var. *umbilicata* from Los Angeles, California (introduced), and sets of *Polymita picta* from Cuba.

By Mr. C. H. Moore:—British Pupillidæ.

By Mr. G. C. Spence:—Congo shells from the collection of Major Paul Dupuis.

593rd (Annual) Meeting, held in the rooms of The Royal Society,
Burlington House, London, on Saturday, October 3rd, 1931.

The President (Mr. R. Winckworth, M.A., F.R.G.S.) in the chair.

Amongst those present were the following:—Messrs. A. E. Salisbury, H. Overton, J. Gordon Dalglish, A. Blok, R. J. Welch, G. L. Wilkins, G. C. Spence, J. Davy Dean, A. Wrigley, C. Oldham, A. W. Stelfox, S. J. Finch, H. C. Fulton, J. R. le B. Tomlin, A. E. Ellis, J. B. Wintle, R. Garnett, Alan P. Gardiner, Alex H. Davison and Mrs. Davison, A. S. Kennard and Mrs. Kennard, Mrs. Winckworth, Mrs. Morehouse, Miss K. M. White, Miss J. D. Robertson, Capt. C. Diver, Lt.-Col. A. J. Peile, Dr. C. Price-Jones, Professor A. E. Boycott, Dr. E. W. Howell and Dr. J. W. Jackson (Hon. Secretary).

Appointment of Scrutineers.

Mrs. Morehouse and Mr. H. Overton were appointed Scrutineers.

Appointment of Auditors.

Messrs. C. H. Moore and F. Taylor were reappointed Auditors.

New Member Elected.

A. R. Waterston.

Resignation.

S. Kierulf Petersen.

Member Deceased.

O. Nordgaard.

Sympathetic reference was made to the recent death of John W. Taylor, one of the Founders of the Society.

Presidential Address.

The President delivered an address on "The British Marine Mollusca," and a cordial vote of thanks was passed unanimously.

Votes of thanks were also accorded to the Council of the Royal Society and to the authorities of the Manchester Museum for the use of rooms for meetings.

Election of Officers and Council.

The Officers and Council for 1931-32 were unanimously elected as nominated.

Exhibits.

By the President :—Metamorphoses of *Trivia*, *Nassarius* and *Clione* from papers by Dr. M. V. Lebour for the Journal of the Marine Biological Association (in the press); specimens of mollusca from Salcombe and other animals associated with them (see Proc. Malac. Soc., vol. 15, p. 1); a series of *Chlamys opercularis* (L.), exhibiting colour variation; *Placenta* [= *Placuna*] of various ages from one month to five years old; shells of all species of English *Sepia*; also eggs, young stages, etc.

By Mr. A. E. Ellis :—Water-colour drawings from life of British slugs, by the Rev. R. A. Ellis; *Planorbis vorticulus* Troschel from all the known British localities, viz. : East Sussex, (Pevensey and Lewes), West Sussex (Amberley, Pulborough and North Stoke), and East Norfolk (Postwick).

By Major Connolly :—Proofs of plates of new African land-shells, including species from the Hale Carpenter collection.

By Rev. E. P. Blackburn :—*Theba cartusiana* found alive in a garden at Hexham.

By Mr. A. R. Waterston :—*Vertigo lilljeborgi* and *V. antivertigo* from Killarney.

By Mr. G. C. Spence :—*Hendersoniella palmeri* Dall from Mexico—unique among Urocoptidæ in having assumed a discoidal form.

By Mr. A. S. Kennard : S. P. Woodward's copy of "Manual of the Mollusca" with ms. additions.

By Mr. A. E. Salisbury :—Examples of commensalism; *Lepton squamosum* Montagu, living in the burrow of *Upogebia deltura* Leach, Salcombe, Sept. 16th, 1931; *Tellinmya ferruginosa* Montagu, living in the anal track of *Echinocardium cordatum* Penn., Salcombe, Sept. 16th, 1931; *Montacuta bidentata* Mont. and *Lepton clarkiae* Clark, living in the burrow of *Phascolosoma vulgare* Blainville, Salcombe, Sept. 15th, 1931.

By Lt.-Col. Peile :—Radula of *Pagodulina subdola* Gredler; radulæ and shells of *Marconia margarita* Pr. from Ruwenzori, and of *M. elgonensis* Pr. from east of Uganda; the shells are hardly distinguishable but the radulæ show several differences.

By Mr. J. R. le B. Tomlin :—Series of the genus *Morum* Roeding, including *ponderosum* Hanley, *grande* A. Ad., *præclarum* Melv. (type), *macandrei* Sow.

(type) and *lamarckii* Desh. : *Voluta adcocki* Tate, *V. festiva* Lam. and *V. aulica* Sow. (3); *Tropidophora formosa* Sow. and *T. deburghiae* Reeve from Madagascar; *Pagodulina subdola* Gredler and albino form from the Tyrol; a number of newly described or little known species of *Clausilia*, including paratypes from Heude's collection, new *Alopias* from Kimakowicz, paratypes of *C. broemmei* Bttg., *C. doerfleri* A. J. W., *C. sturanyi* A. J. W., *C. matulici* Stur. and others; *C. boudha* B. & D., *C. cazioti* B. & D.

By Mr. C. Oldham:—*Helicigona zonata*, Zermatt, Switzerland: with young (bred) shells to exhibit the pubescent down of the early stages; *Limnæa pereger*, Schwarzsee, Zermatt, Switzerland, 8320 feet, showing varying degrees of scalarity; *Viviparus contectus*, aquarium bred specimens, one of which attained an age of five years and ten months.

By Mr. H. Overton:—Mollusca from the Bernese Oberland; *H. aspersa* from Nevin; young examples of an *Oxystyla*, found in crevices of the bark of *Andira inermis*, the Cabbage Bark Tree, from South America.

By Mr. J. G. Dalgliesh:—*H. aspersa*, *H. virgata*, *C. nemoralis* and *C. hortensis* from Sussex.

By Dr. G. D. Hale Carpenter:—New species from Uganda and S.E. Sudan, including *Euæthiops obtusus* Con., *Bocageia carpenteri* Con., *Vitrina variopunctata* Con., *Gulella porcina* Con., *G. carpenteri* Con., *Homorus didinganus* Con. and *Nothapalus sagittula* Con.

By Mr. G. L. Wilkins:—Egg capsules of *Busycon carica* Gm., *B. canaliculatus* L., *Fasciolaria distans* Lk. from the U.S.A.; dry and spirit specimens of *Pholas dactylus* L. from Kingsdown, Kent; *Teredo navalis* L. from Shellness; feeding tracks, radula, etc. of *Patella vulgata* L.

By Mr. A. G. Stubbs:—Drawings of Mollusca, including *Limax cinereoniger* from near Midhurst, *Milax gagates*, *H. hortensis* (orange var.) from Kent and *H. nemoralis*, large and beautifully coloured, from woods round Arundel.

By Prof. A. Morley Davies:—Series illustrating the evolution of *Placuna*; the genus *Anomia*, which ranges from the Mesozoic era to the present day with no essential change, has a concave left valve and a flat right valve in which the byssal notch takes the form of a circular perforation. From the Middle Eocene of N.W. India there was exhibited an undescribed species of *Anomia* in which the left valve is much flatter and both valves show the delicate radial ornament which persists through the series of forms leading to *Placuna*. This species may therefore be considered the ancestor of the *Placuna* stock. It is followed in the Middle and Upper Eocene (Moqattam beds) of Egypt, by the well-known *Carolia placunoides* Cantraine, in which various stages in the closing of the foramen and arching of the resiliophore which overlies it were shown by three adult specimens exhibited (see figures in Fischer's "Conchyliologie," for example). These indicate a rapidly evolving species. From the Miocene of India (and the Siwa oasis and Portugal) Vredenburg has described species in which all trace of foramen has disappeared and the arched resiliophore has become bent into an obtuse V shape: for these forms Vredenburg proposed the name *Indoplacuna* (as sub-genus of *Placuna*). Finally, in the recent *Placuna* (or *Placenta*) of the Indian Ocean, the resiliophore has become very acutely V-shaped.

ANNUAL REPORT.

THIS is the Fifty-Fifth Annual Report of the Society. During the last year the Society has lost eleven members by death, seven by resignation, and two have been struck off the list of members under Rule IV. Twelve new members have been elected during the last twelve months, including one at this meeting. The present membership is 242, including four Honorary Members.

The losses by death are: J. W. Taylor, Greevz Fysher, F. Rhodes, J. Williams Vaughan, Miss Massy, Sir Charles Eliot, H. H. Booker, J. E. Crowther, B. B. Woodward, O. Nordgaard and F. W. Fierke. These represent a very serious loss to the Society. Short obituaries of two of these have been published in the *Journal of Conchology*, viz., of B. B. Woodward, vol. 19, p. 112, and of Sir Charles Eliot, vol. 19, p. 145. The pages of the *Journal* also contain a reference to the death of a former member of the Society—a well-known conchologist and collector—John Brazier (vol 19, p. 110).

Five ordinary monthly meetings have been held at the Manchester Museum by the kind permission of the authorities. One in January was cancelled owing to fog. On November 8th, there was a joint meeting with the Leeds Branch at Leeds. There were numerous interesting exhibits and the Honorary Secretary gave a Lantern lecture on "Some British Snails and their Habitats." On April 18th a special meeting was held at Manchester with the President, Mr. R. Winckworth, M.A., F.R.G.S., in the chair. There was a good attendance, including members from Yorkshire and North Staffordshire.

The only Special Exhibit of the year has been *Trivia* and *Pustularia*.

Three numbers of the *Journal* have appeared since the date of the last Annual Meeting, viz. vol. 19, no. 3, December, 1930; no. 4, March, 1931; and no. 5, July, 1931, comprising 92 pages of text, 4 plates, and 47 text-figures.

These were received from the publishers by post as follows: no. 3 on 22/12/30; no. 4 on 2/4/31; no. 5 on 22/7/31.

Additions to the cabinet have been made by Hans Schlesch, P. P. Milman and Dr. G. D. Hale Carpenter (collection of land mollusca from Uganda).

Additions to the Library have been received from Messrs. H. H. Bloomer, C. Oldham, T. K. Chamberlain, H. Schlesch, J. R. M. Bergenhayn, H. Burrington Baker, R. A. Phillips, H. Watson, R. Winckworth, A. E. Ellis, G. C. Robson, J. B. Reeside, Jr., A. Allen Weymouth, A. C. Stephen, Professor T. D. A. Cockerell, Miss D. Aubertin and Miss Tera van Benthem Jutting. Dr. G. D. Hale Carpenter has also presented bound copies of the following:—"A History of British Mollusca" by Forbes and Hanley, 4 vols.; "Les Coquilles Terrestres de France" by Locard, 1894; and "Les Coquilles des Eaux Douces et Saumâtres de France" by Locard, 1893, all from the Library of the late Herbert C. Napier.

RECORDER'S REPORT (Non-Marine Mollusca).

SINCE the last report (vol. xix, p. 123, where on line 19 "vol. xviii, p. 299" should be corrected to vol. xix, p. 30) 198 new records have been added to the Census. A. R. Waterston and D. K. Kevan have made many additions to the Scottish lists and have found *Bithinia leachii* and *Amnicola taylori* in Scotland for the first time; they have also widely extended the range of *Vertigo lilljeborgi* into Argyle, Dumbarton, Perth, Peebles and Westmorland: members should verify their *V. antivertigo* to make sure that they have not overlooked *lilljeborgi*. G. L. Wilkins

has found *Trochula elegans* in Surrey (above p. 147) 70 miles west of its only known habitat near Dover, and A. E. Ellis has at last verified *Arion subfuscus* in East Anglia. Further specimens of *Milax* are needed from most parts of the British Isles to verify the occurrence of *sowerbii* and *gagates* as distinct from the new *gracilis* (above p. 65): all the *gracilis* so far have been found in gardens. Recent searches have failed to reveal *Helix pisana* in Cornwall, where it was at one time abundant near St. Ives: further enquiry is needed.

Cornwall W. (1):—*Milax sowerbii*, *M. gagates* (C. Oldham).

Cornwall E. (2):—*Milax sowerbii*, *Sphærium lacustre* (A. E. Boycott), *Milax gagates* (L. W. Grensted).

Devon S. (3):—*Milax sowerbii*, *M. gagates*, *M. gracilis*, *Vitrina major* (above p. 60: A. E. B.).

Devon N. (4):—*Milax sowerbii* (A. E. B.).

Dorset (9):—*Milax gagates*, *M. gracilis* (A. E. B.).

Isle of Wight (10):—*Milax sowerbii* (C. O.), *M. gagates*, *M. gracilis* (L. E. Adams and G. C. C. Damant).

Sussex W. (13):—*Hyalinia lucida* (A. G. Stubbs), *Milax sowerbii*, *M. gagates*, *Paludestrina stagnalis*, *Phytia myosotis* (A. E. Ellis).

Sussex E. (14):—*Milax sowerbii*, *M. gagates*, *M. gracilis* (J. R. le B. Tomlin), *Pisidium hibernicum* (G. Shrubsole).

Kent E. (15):—*Milax sowerbii* (H. C. Huggins), *Vallonia excentrica*, *Ancylus lacustris*, *Assemanina grayana*, *Pisidium personatum*, *P. pulchellum* (J. E. Cooper).

Surrey (17):—*Milax sowerbii*, *M. gracilis* (C. I. Paton and J. V. Dacie), *Trochula elegans* (G. L. Wilkins).

Essex S. (18):—*Milax sowerbii* (C. O. and A. E. B.).

Essex N. (19):—*Arion circumscriptus* (J. A. Boycott).

Herts. (20):—*Milax sowerbii* (A. E. B.).

Middlesex (21):—*Milax gracilis* (A. R. Waterston).

Berks. (22):—*Milax gagates* (C. P. Hurst).

Suffolk E. (25):—*Helicella caperata caperata* (A. E. E.).

Suffolk W. (26):—*Agriolimax lævis*, *Helicella caperata caperata*, *H. herispensis*, *Carychium minimum* (A. E. Ellis).

Norfolk E. (27):—*Milax sowerbii*, *M. gagates*, *Arion subfuscus* (Old Buckenham), *Hyalinia lucida*, *Planorbis vorticulus*, *Valvata macrostoma* (A. E. E.).

Norfolk W. (28):—*Agriolimax lævis*, *Arion subfuscus* (Walton), *Euconulus fulvus*, *Helicella caperata caperata*, *Ashfordia granulata*, *Vertigo antivertigo* (A. E. E.).

Cambridge (29):—*Milax sowerbii*, *M. gagates*, *Helicella caperata caperata* (H. Watson).

Monmouth (35):—*Milax gracilis*, *Vertigo pygmæa* (A. E. B.), *Limnæa stagnalis*, *Planorbis glaber*, *Pl. vortex*, *Pl. contortus*, *Pisidium hibernicum*, *P. milium*, *P. obtusale*, *P. personatum* (G. Shrubsole).

Hereford (36):—*Milax sowerbii*, *M. gracilis* (M. A. Boycott).

Worcester (37):—*Milax sowerbii*, *M. gracilis* (H. W.).

Salop (40):—*Milax gracilis* (A. E. B.).

Glamorgan (41):—*Milax gracilis*, *Physa acuta* (lily pond, Swansea: H. E. Quick).

Pembroke (45):—*Milax sowerbii* (A. E. E.).

Denbigh (50):—*Milax gracilis* (H. W.).

Leicester (55):—*Planorbis nautilus* (F. M. Turner).

Notts. (56):—*Milax sowerbii* (T. W. Saunders).

Cheshire (58):—*Milax gracilis* (Miss Hodgson).

Lancs. S. (59):—*Milax gracilis* (R. A. Barr).

Yorks. S.E. (61):—*Truncatellina cylindrica* (on Kilnsea Warren, 1894, T. Petch).

Yorks. N.W. (64):—*Milax gracilis* (K. Howell).

Durham (66):—*Milax gagates* (G. H. Harrison), *Hyalinia lucida* (W. Philipson), *Arion minimus*, *Pisidium hibernicum* (E. P. Blackburn), *P. nitidum* (D. K. Kevan).

Northumberland S. (67):—*Milax sowerbii*, *Vitrina major* (above p. 60), *Physa acuta* (greenhouse in Newcastle), *Pisidium milium* (E. P. B.), *Acanthinula lamellata* (E. P. B. and G. W. Temperley). A live *T. cartusiana* found in a garden at Hexham (E. P. B.).

Northumberland N. (68):—*Limnæa stagnalis* (Newham: G. Bolam).

Westmorland (69):—*Vertigo lilljeborgi* (Blelham Tarn: D. K. K.).

Isle of Man (71):—*Milax sowerbii* (C. I. Paton).

Peebles (78):—*Vertigo antivertigo*, *V. lilljeborgi*, *Limnæa palustris*, *Pisidium henslowanum*, *P. hibernicum*, *P. subtruncatum* (D. K. K.), *P. amnicum*, *P. obtusale* (A. R. W. and D. K. K.).

Selkirk (79):—*Agriolimax lævis*, *Acanthinula lamellata*, *Sphyradium edentulum* (A. R. W. and D. K. K.).

Berwick (81):—*Pisidium personatum* (D. K. K.).

Haddington (82):—*Succinea oblonga* (Tynninghame: D. K. K.), *H. nemoralis* with *H. hortensis* on sandhills at Canty Bay (A. R. W.).

Edinburgh (83):—*Testacella haliotide*, *Zonitoides nitidus*, *Paludestrina jenkinsi* (greenhouse), *Acme lineata* (A. R. W.).

Linlithgow (84):—*Limax arborum*, *Planorbis fontanus*, *Valvata cristata* (D. K. K.), *Helix hortensis*, *Pisidium hibernicum*, *P. milium* (A. R. W.), *P. henslowanum* (D. K. K. and A. R. W.).

Fife (85):—*Vallonia costata*, *Ashfordia granulata*, *Pupa anglica*, *Paludestrina stagnalis* (A. R. W.).

Stirling (86):—*Bithinia leachii*, *Amnicola taylori* (Grangemouth timber ponds: A. R. W.), *Succinea oblonga*, *Pisidium milium*, *P. personatum*, *P. subtruncatum* (A. R. W. and D. K. K.).

Perth W. (87):—*Succinea putris*, *Vertigo lilljeborgi* (L. Lubnaig: A. R. W. and D. K. K.).

Main Argyle (98):—*Limax cinereoniger* (G. C. C. Damant), *Vertigo lilljeborgi* (L. Tromlee, A. R. W.), *V. pusilla* (Glen Nant, A. R. W. and D. K. K.).

Dumbarton (99):—*Arion minimus*, *Zonitoides nitidus*, *Vertigo lilljeborgi* (Glen Falloch), *Limnæa palustris* (A. R. W. and D. K. K.).

Clyde Islands (100):—*Milax sowerbii*, *M. gagates*, *Helicella caperata caperata*, *Vallonia excentrica*, *Acanthinula aculeata*, *Acme lineata*, *Pisidium personatum*, *P. obtusale* (Arran: A. R. W.).

Orkney (111):—*Milax gagates* (C. O.), *Helix aspersa* (gardens in Kirkwall for many years), *Helicella caperata caperata* (Birsay: R. Rendall).

Dublin (124):—*Milax sowerbii* (C. O.).

Kilkenny (129):—*Milax gracilis* (R. A. Phillips).

Galway W. (139):—*Milax sowerbii* (R. A. P.).

Galway S.E. (140 S):—*Milax gagates* (R. A. P.).

Clare (141):—*Milax sowerbii*, *M. gracilis* (R. A. P.).

Tipperary N. (143):—*Milax gagates* (R. A. P.).

Tipperary S. (144):—*Milax gagates* (R. A. P.).

Cork E. (146 E):—*Milax sowerbii*, *M. gagates*, *M. gracilis* (R. A. P.).

Cork M. (146 M):—*Milax gracilis* (R. A. P.).

Cork W. (147):—*Limax flavus*, *Milax sowerbii*, *M. gagates*, *Hygromia fusca*, *Vertigo pygmaea*, *Physa acuta* (garden pond at Glengarriff), *Pisidium lilljeborgii*, *P. personatum* (C. O., A. R. W. and A. E. B.).

Kerry N. (148 N):—*Agriolimax laevis*, *Milax sowerbii*, *Arion ater*, *A. minimus*, *A. circumscriptus*, *Hyalinia pura*, *Zonitoides nitidus*, *Vertigo antivertigo*, *V. lilljeborgi* (west of R. Flesk near L. Leane), *V. substriata*, *Planorbis albus*, *Pl. nautilus*, *Pl. contortus*, *Valvata cristata*, *Pisidium lilljeborgii*, *P. nitidum*, *P. hibernicum* (C. O., A. R. W. and A. E. B.), *Margaritana margaritifera* (R. Laune, E. Bullock).

Kerry S. (148 S):—*Milax sowerbii*, *M. gagates*, *M. gracilis*, *Euconulus fulvus*, *Planorbis albus*, *Pl. fontanus*, *Aplexa hypnorum*, *Valvata piscinalis*, *V. cristata*, *Sphærium corneum* (C. O., A. R. W. and A. E. B.).

RECORDER'S REPORT (Marine Mollusca).

MR. H. B. Moore's researches at Millport Biological Station have made it clear that *Nucula nitida* var. *radiata* Marshall must be given specific rank, and it has received the name *Nucula moorei* Winckworth, since *N. radiata* is preoccupied. Its ascertained distribution includes Cornwall, Devon, South Wales, Loch Striven, Loch Long, Sandwich.

Mr. Rendall reports *Eledone cirrhosa* (Lamarck) and *Ommastrephes sagittatus* (Lamarck) from Orkney.

The record of *Acmea subcylindrica* (L.), often known as *Truncatella*, from Shoreham, Sussex, is interesting: Mr. A. E. Ellis found it living on *Suaeda maritima*.

Though dead shells are not accepted as records, they are often the only indication of a wide distribution. I have received several collections of shells for identification and the following species are worth noting:—*Macrocallista chione* (L.) from Nevin beach, Carnarvon (J. W. Jackson); *Gastrana fragilis* (L.), valves abundant at Pwllheli (J. W. J.) and Llanbedrog (G. C. Spence), both in Carnarvonshire; *Ondina obliqua* (Alder) from Giant's Causeway (N. Fisher).

YORKSHIRE CONCHOLOGICAL SOCIETY.

Report of the Leeds Branch of the Conchological Society of Great Britain and Ireland.

THE officers for 1931 are:—President: H. J. Armstrong, Leeds. Vice-Presidents: Mrs. E. M. Morehouse; J. C. North, F.R.P.S.L. Council: T. Coote; Miss K. Morehouse; W. Gyngell; Miss E. Dufty. Hon. Secretary and Treasurer: J. R. Dibb, F.E.S.

Meetings have been held as follows:—

January 10th. Combined exhibit of *Helix aspersa*, and short papers.

February 14th. General Exhibits.

March 15th. Presidential Address entitled "The Use of Shells."—Mr. H. J. Armstrong.

April 18th. Joint Meeting with the Parent Society at Manchester Museum followed by an examination of the shells in the Manchester Museum by the Y.C.S. members. Dr. J. W. Jackson, F.G.S., displayed the specimens.

During the summer four field meetings have taken place. In May, Allerton Bywater was visited with fairly good results. In June a joint meeting with the Y.N.U. Conchological Section and the York Field Naturalists Club was held at Askham Bog, near York. Results were rather poor for this usually prolific hunting ground.

A meeting at Bishop Wood was held in July. Wentbridge was visited in September in conjunction with the Y.N.U. Conchological Section and the Doncaster Scientific Society. This completed the summer field meetings and the conclusion is that the year has been a poor one for conchologists.

On October 12th, the 35th Annual Meeting was held in Leeds, when an attractive programme of activities for 1932 was drawn up.

The November and December meetings are yet to take place and the former will be a joint meeting with the Parent Society in Leeds, when the lecturer is to be Mr. Fred Taylor of Oldham. The last meeting of this session will take the form of a combined exhibit of *Helix virgata*.

The Society has suffered severe loss through the deaths of Mr. Fred Rhodes of Bradford, Mr. Greevz Fysher of Leeds and Mr. John W. Taylor of Horsforth. Mr. Taylor was a founder of the Society in 1896 when its name was the "Leeds Conchological Club" and he held the position of Honorary Life President for many years.

Membership now stands at 35.

JOHN R. DIBB (*Hon. Sec.*)

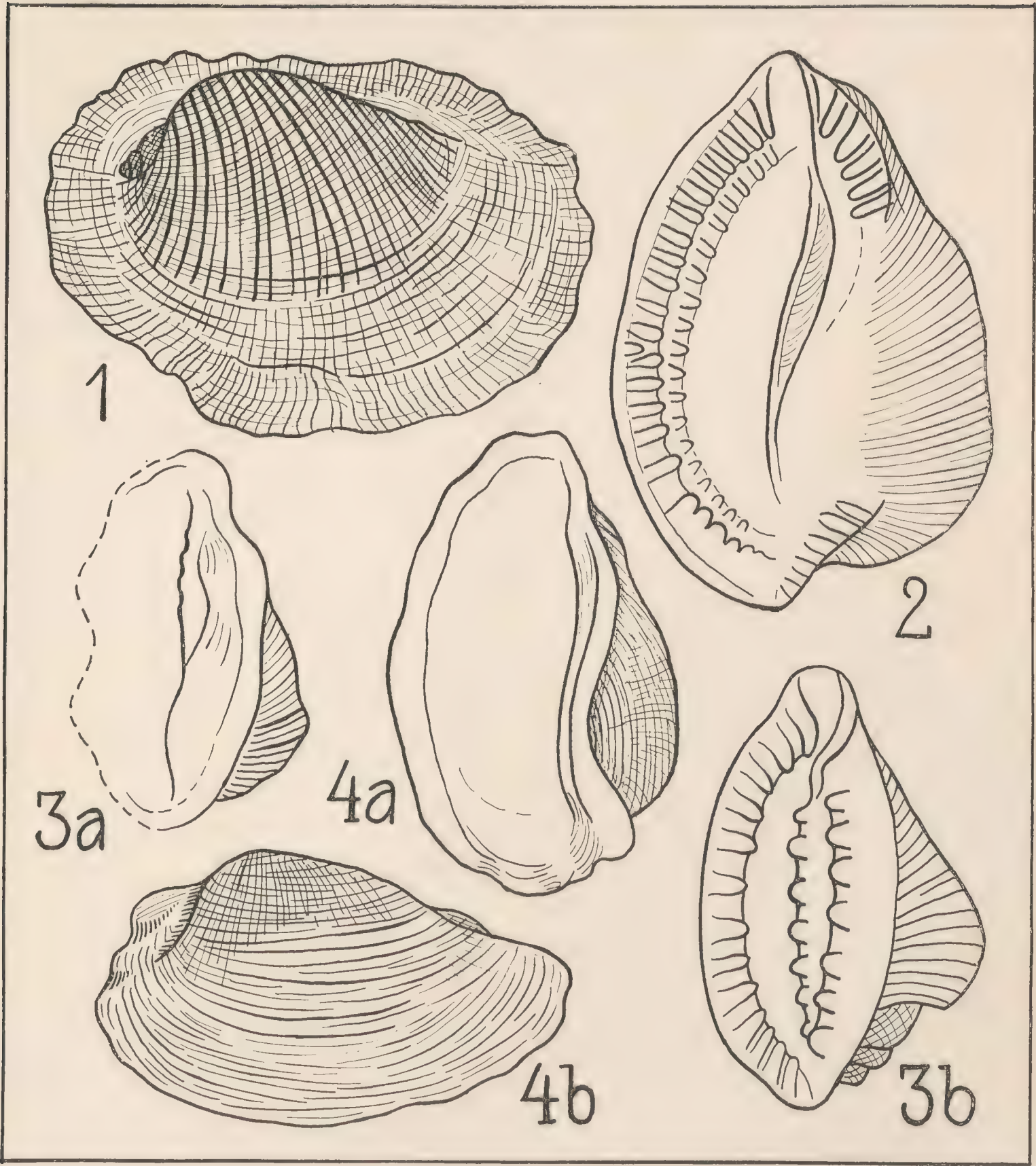
ANNUAL REPORT OF THE LONDON BRANCH.

NINE Meetings have been held at the Cripplegate Institute, E.C.1, and I am glad to be able to report that the Session has been quite up to standard. Mr. A. S. Kennard has continued in the chair, to the great satisfaction of the Members. Attendance, although not large, has been regular, and all members have contributed to the exhibits.

Field Meetings were held in May and June—one to Enfield in May, led by the Rev. H. E. J. Biggs, and one to Chaldon in June, led by the Hon. Sec. Enfield proved an entire failure owing to the heavy rain which fell throughout the afternoon. Chaldon, however, was more encouraging. *Trochula elegans* was the chief attraction, but a list of some 15 other species was compiled. Owing to bad weather no July Field Meeting was arranged.

The new Session opens on October 12th.

GUY L. WILKINS (*Hon. Sec.*).



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(see p. 169).

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It is believed that students of the Mollusca will find material of value to them in these volumes, whether they are interested in species of the world, or in those of a local fauna.

In the later volumes the fossil forms also, of the genera dealt with, are classified and listed.

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CONCHOLOGY.

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BEING THE ORGAN OF THE CONCHOLOGICAL SOCIETY
OF GREAT BRITAIN AND IRELAND.

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PLATE VII.

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No. 7.

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 Shaw, Rev. W. A., West Stoke Rectory, Chichester.
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 Van Benthem Jutting, Miss T., Zoological Museum, Plantage Middenlaan 53,
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Vivipara contecta at Blaxton.—Just on the borders of Yorkshire and Lincolnshire is a habitat for *V. contecta*, Bank End, Blaxton is the name of the place. Up to 1928 one was always sure of a “fair bag,” but in 1928 this species was so abundant that the bed of the drain was literally covered with them for about 200 yards; then they gradually thinned out and none were to be had. In 1929 and 1930 the drainage cleaners got to work, and so thoroughly that in 1930 not more than 20 mature specimens were observed. Last year (1931) during the one visit I paid only two dead shells were found by a friend and myself after dredging for nearly two hours. In the “Published Records of the Land and Freshwater Mollusca of the East Riding with Additions” T. Petch states that Dr. Martin Lister discovered this species in the neighbourhood of Wressle more than 200 years ago. Two dead shells were found at Fulford, Yorks., in 1883. W. Nelson found a “few mostly young” in the Fleetdyke, Wressle in 1884. This species seems to be becoming almost rare.
 —ELSIE M. MOREHOUSE.



Mollusca eaten by Rabbits.—During 1931 a friend of mine, Miss B. Bailey, visited Portrush and on my request sent me a number of shells from the mouths of rabbit burrows. These consisted mainly of *Helix nemoralis* L. as they did on my visit, but amongst them were two specimens of *Helix aspersa* Müll. which had been devoured in exactly the same way, the line of tooth marks round the body whorl being, in every respect, like those found on other species already recorded (Journal of Conchology, vol. 18 pp. 327-335).—A. K. LAWSON (*Read before the Society, Feby. 3rd, 1932*).

NOTES ON A MOONSTONE FROM VENEZUELA.

By GEORGE C. SPENCE.

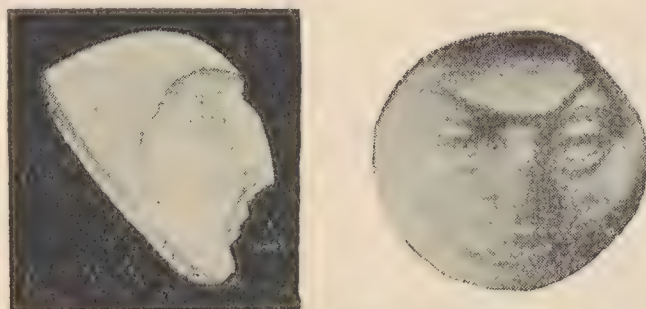
(Read before the Society, March 2nd, 1932).

IN THE *Journ. of Conch.*, vol. 16, page 62, the following note of an exhibit by the late W. H. Heathcote appears, viz. :—

“*Orthalicus zebra* and a very curious carved moonstone idol found in the interior of one of the shells. The specimens were obtained some forty years ago from a hollow log of wood from the Gulf of Maracaibo, Venezuela.” (The discovery was made whilst cutting up the log in a Liverpool timber yard).

Through the kind offices of Dr. J. W. Jackson, I am able to offer the following notes :—

The present owner of Heathcote's collection has been good enough to search but is unable to find the shells in question. Now the name *Orthalicus zebra*—it will be noticed that no “authority” is given—is void and enters into the synonymy of a considerable number of species, but it is quite possible that *O. zebra* (Müll.) represented the mollusc now known as *Oxystyla undata* (Brug.) which hails from the Antilles and Southern Florida, but is not known to occur in South America. There is, however, a closely allied form, *Oxystyla maracaibensis* (Pfr.), which does occur at Maracaibo and is found, in Columbia at any rate, “in holes in tree trunks.”¹ In the absence of the actual specimens it would appear reasonable to assume that they were *maracaibensis*.



I give full face and profile illustrations of the “idol” itself, which is a most delicately carved moonstone (an opalescent variety of orthoclase) of small size, the diameter being approximately 6 mm. Mr. T. A. Joyce, of the British Museum, to whom I submitted it, has been kind enough to interest himself in the matter, and has come to the conclusion that the stone is wheel cut. It therefore cannot be of native origin but is probably the work of some Spanish craftsman early in the 16th century, who was possibly influenced in his design by native art. The stone was probably intended to be set in a ring, but how it came to be in the situation in which it was found must remain unknown.

¹ Pilsbry's “Manual,” (2) vol. xii, page 138.

HELIX POMATIA L. IN SUSSEX.

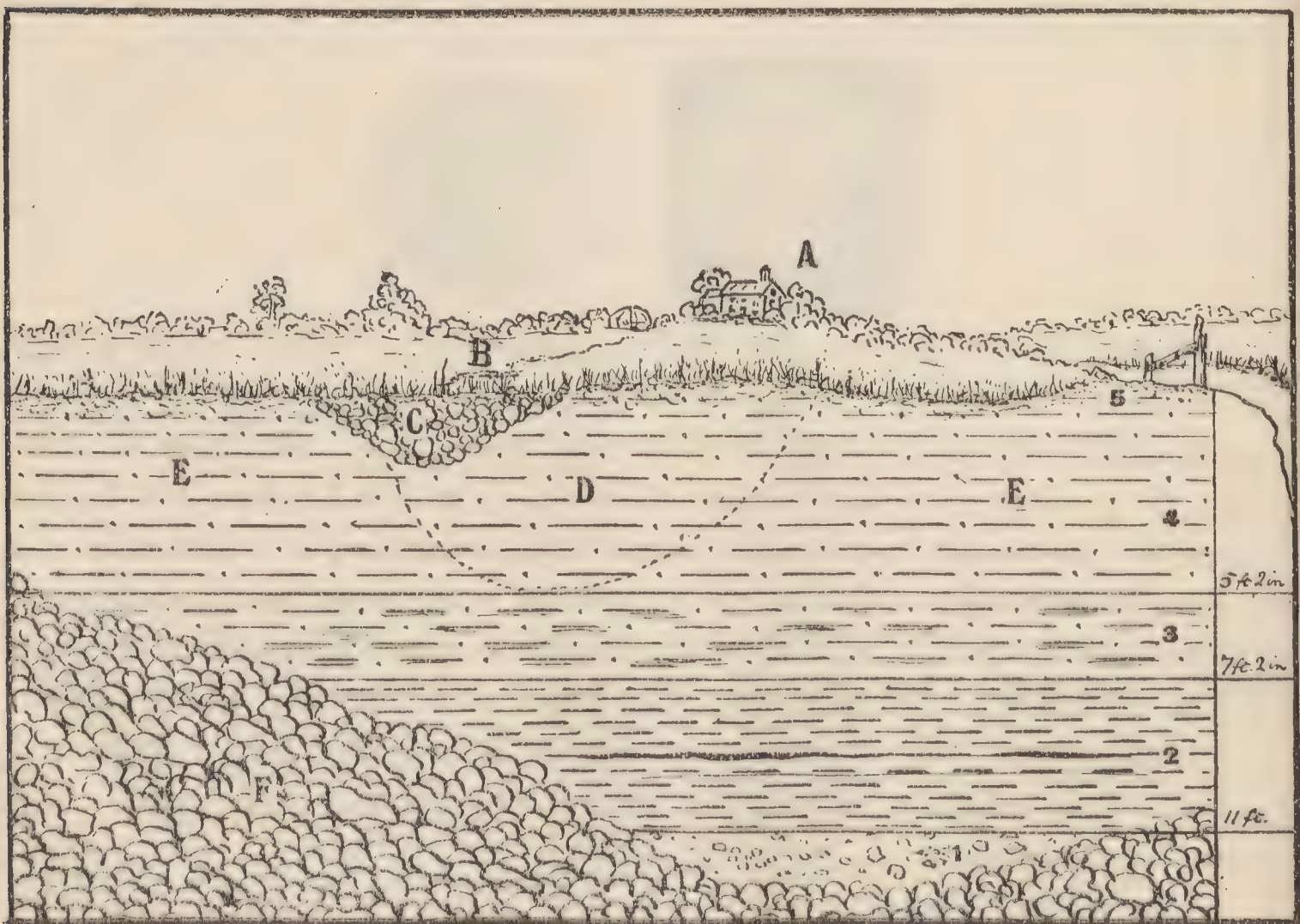
By W. D. LANG, M.A., Sc.D., F.R.S.

(Read before the Society, March 2nd, 1932).

Helix pomatia was recorded in 1667 as found in the county of Sussex; and since then has occurred near Chichester and in a copse upon the Downs not far from Petersfield. In the last two localities, however, it is thought to have been introduced from Surrey and Hampshire, respectively.¹ It has now been found at about two feet below the surface in a Drift deposit near Littlehampton; and since its provenance is of some interest, an account is here given of the section in which it occurred, with a list of the associated fauna. The mollusca have been examined and identified by Mr. A. S. Kennard, F.L.S., who called my attention to the interest of *Helix pomatia* occurring in the county, and to whom I tender my best thanks for his help and interest. Some brief notes on the section appeared in the Report of Proceedings, 1926-1927 (1928), Nature and Archæology Circle, Littlehampton, pp. 14-16.

The section is a little sea-cliff of Drift, about seven feet high, and situated about half a mile east of Angmering-on-Sea, and due south of Kingston Farm. It is part of a continuous low cliff of

¹ See J. W. Taylor, 1910, Monograph of the Land and Fresh Water Mollusca of the British Isles, vol. III, part 17, p. 231.



similar character, which runs for a mile or more along the shore at this point. The cliff is composed of the "Brick Earth" of the Geological Survey.¹ A glance at the figure will show that several deposits are exposed on the cliff.

The lowest bed (Bed 1) yet shown has been beached over during the last few years—indeed, when last visited only about the topmost three feet of the section were visible. It forms the foreshore and is composed of chalky rubble. On this lies Bed 2, a blue clay, which showed, where exposed on the foreshore about 100 yds. E. of the section, an occasional thin black streaky layer, probably of vegetable origin, and one layer $\frac{1}{2}$ "—2" thick of evil-smelling vegetable remains. Its whole thickness was nowhere exposed, but it may be estimated as about 4 ft. A similar blue clay has been observed at other spots on the foreshore, but no shells have as yet been found in it. The blue clay of Bed 2 passes upwards into Bed 3, a yellow loam with occasional strings and little pockets of small flints, differing from the bed above it (Bed 4) in being somewhat shaly and having a tendency for more clayey lenticles to be segregated from a more sandy matrix. It is about 2 ft. thick and contains *Succinea oblonga* and crushed *Sphærium* sp., and has been identified by Mr. Kennard as Pleistocene.²

Bed 3 passes imperceptibly into Bed 4, a loam which does not exhibit the shaliness and more clayey lenticles of Bed 3. The faunal change, however, is abrupt, for *Succinea oblonga*, which characterises Bed 3 and is not found in Bed 4, occurred as high as 5 ft. 3 inches from the top of the section; while *Helix nemoralis* occurred in Bed 4 as low as 5 ft. 2 inches; *Limnæa truncatula*, which is common in Bed 4, at about the same distance; and *Helix aspersa*, which is abundant in bed 4, as low as 5 ft. from the top of the section. At the top of the cliff, and breaking it for a depth of about 2 ft., is the transverse section of an old stream-bed, the former course of which can just be traced as a wavy track in the field behind. The present drainage is carried by a ditch beside the lane leading direct from Kingston Farm to the sea. The section of the stream-bed on the cliff-face is filled with coarse, Recent beach material. Probably this filled the stream-mouth when it was at sea-level, and the whole has been raised some 5 ft. It is true that the beach could have been thrown up into the hollow at its present level by storms; but that would argue a channel which had remained open, and unlike the in-filled course in the field behind the cliff. Nearly all

¹ Clement Reid, 1903, Mem. Geol. Survey England & Wales, Geology of the Country near Chichester, p. 42.

² The crushed *Sphærium* were not identified by Mr. Kennard.

the fauna recorded below occurred beneath the eastern half and on the eastern side of the stream section, suggesting that flood-water overflowed on the eastern side and there deposited the land-shells which it carried.

The fauna of Bed 4 is as follows:—

MAMMALIA.

Domestic Pig. Molar of 'waster.' Kindly identified by Mr. M. A. C. Hinton.

Rodent limb-bone.

AVES.

Beak of finch.

AMPHIBIA.

Amphibian limb-bone.

MARINE MOLLUSCA.

Ostrea edulis Linnæus. Occasional throughout Bed 4.

Littorina littorea (Linnæus). One specimen at about 2 feet from top of section.

NON-MARINE MOLLUSCA.¹

Carychium minimum Müller. At about 2 ft. from top.

Limnæa (*Radix*) *pereger* (Müller). Not in place.

Limnæa (*Galba*) *truncatula* (Müller). Rather common, from near the top to about 5 ft. from the top.

Vallonia excentrica Sterki. At about 2 ft. from top.

Cochlicopa lubrica (Müller.) Several specimens, from 1 to 3 ft. from top.

Goniodiscus rotundatus (Müller). Several specimens, from 1 to 3 ft. from top.

Helicella (*Helicella*) *cellaria* (Müller). Several specimens, from 1 to 5 ft. from top.

Helicella (*Retinella*) *nitidula* (Draparnaud). Several specimens, from 1 to 5 ft. from top.

Vitrea crystallina (Müller). One specimen, 4 to 5 ft. from top.

Limax (*Lehmannia*) *arborum* Bouchard-Chantereaux. Two specimens, at about 4 ft. and 2 ft. from top, respectively.

Theba cartusiana (Müller). One specimen at 2½ ft. from top.

Fruticicola (*Capillifera*) *hispida* (Linnæus). Throughout the bed and abundant in the top two feet.

Helix (*Helix*) *pomatia* Linnæus. An immature specimen at about 2 ft. from the top. Collected 5, x, 1931.

Helix (*Helix*) *aspersa* Müller. Common throughout.

Helix (*Cepæa*) *nemoralis* Linnæus. Occasional throughout.

¹ The nomenclature and order is that followed in A. S. Kennard & B. B. Woodward.

Clausilia rugosa (Draparnaud). Two specimens, at about 2 ft. and 3 feet from top respectively.

Cecilioides acicula (Müller). A few specimens, at about 2 ft. and 5 ft. from top, respectively.

EXPLANATION OF FIGURE.

Diagrammatic sketch-section of the Cliff S. of Kingston Farm, E. of Littlehampton, Sussex.

- A. Kingston Farm.
- B. Old course of stream winding across meadow to cliff-face.
- C. Old bed of stream filled with Recent beach-material.
- D. Approximate area of section (bounded by dotted lines) in which the bulk of the fauna of bed 4 occurred.
- E. Cliff-face.
- F. Recent beach, covering the section to varying heights.
- 5. Soil and sub-soil. 1 ft.
- 4. Bed 4. *Helix aspersa* loam. 4 ft. 2 inches.
- 3. Bed 3. Pleistocene loam with *Succinea oblonga*. 2 ft.
- 2. Bed 2. Blue Clay. Occasional vegetable seams. About 4 ft.
- 1. Bed 1. Chalky rubble.



Mollusca of the Great Saltee.—In June, 1913, Dr. R. Lloyd Praeger collected nine species of land snails on the Great Saltee, an island of granite covered in most of its area by boulder clay, on the S.E. coast of Wexford (*Irish Nat.* xxii, p. 218). In 1914 Mr. R. A. Phillips found nineteen species, eleven of which, including *Paludestrina jenkinsi* and other freshwater forms, were additions to Dr. Praeger's list (*Irish Nat.* xxiii pp. 226-7). Mr. Phillips's *Pisidium pusillum* no doubt referred to *P. cinereum* or *personatum*, or both. A visit to the Great Saltee in June 1930 enabled me to add a further five species to the island fauna. The complete list is:—*Limax maximus*, *L. arborum*, *Agriolimax agrestis*, *Vitrina pellucida*, *Hyalinia crystallina*, *H. alliaria*, *Arion ater*, *A. subfuscus*, *A. intermedius*, *Pyramidula rotundata*, *Helicella virgata*, *H. caperata*, *Cochlicella barbara*, *Hygromia hispida*, *Helix aspersa*, *H. nemoralis*, *Cochlicopa lubrica*, *Pupa cylindracea*, *Carychium minimum*, *Limnæa pereger*, *L. truncatula*, *Planorbis leucostoma*, *Paludestrina jenkinsi*, *Pisidium cinereum* and *P. personatum*.—CHAS. OLDHAM.

Occurrence of *Helix pomatia* Linn. in the Holocene of Sussex.—The interesting discovery by Dr. W. D. Lang of a very young example of this species in a Holocene deposit in Sussex is no real proof that the species ever lived in the county. In the course of my work on the Holocene deposits I have noted a number of cases where a shell though occurring in a deposit clearly owes its presence to extraneous causes. I may note the following:—*Zonitoides excavatus* (Bean) and *Peringia ulvæ* (Penn.) in Nanna's Cave, Caldy, *Phytia myosotis* (Drap.) at Finsbury Circus, London, the same species at Greenhithe, Kent, *Assemanina grayana* Leach at Ilford, and *Succinea pfeifferi* Rossm. at Otford. There is no need to give all the evidence but in each case the species could not reasonably have been expected to be present. I think the probable explanation is that in all these cases the shells have been carried from some distance by birds in their crops. I have found an example of *Trochulus striolatus* (Pfeiff.) in the castings of a bird of prey, presumably Owl or Kestrel and I think that it was by some such means that the example of *Helix pomatia* Linn. was conveyed to its place of entombment.—A. S. KENNARD (Read before the Society, March 2nd, 1932).

NOTES on LAND MOLLUSCA of the MALAY ARCHIPELAGO.

BY MISS TERA van BENTHEM JUTTING.

(Read before the Society, February 3rd, 1932).

PLATE VII.

I. THE GENUS *OPISTHOSTOMA* IN THE MALAY ARCHIPELAGO
WITH DESCRIPTIONS OF TWO NEW SPECIES FROM JAVA.

THE Genus *Opisthostoma* Blanford 1860 comprises some three dozen species among which, though so small, are several that exhibit the most peculiarly shaped shells imaginable. Representatives are known to inhabit Southern India, Malaya and Borneo (Gude, Fauna of British India, Mollusca, vol. iii, 1921, p. 296) living amongst decaying plant material, mosses and earth, especially in hilly country.

Most of the species seem to be locally distributed. Their minute size, however, makes them easily overlooked if not purposely sought for.

In total about 35 species are known at present, the greater part of which (circa 25) has been recorded from British North Borneo and adjacent islands.

Our present state of knowledge divides the genus into 3 subgenera, viz. *Geothauma*, *Plectostoma* and *Opisthostoma* s. str. according to the presence or absence of lamellæ or spines on the shell and the last whorl with aperture attached to the penultimate one or not. Further particulars are to be found in Kobelt, Cyclophoridæ in Tierreich, 1902, p. 412.

A list of the Bornean species with their principal literature is given beneath. To each name is added the reference for its original diagnosis and a list of papers in which the occurrence is actually stated.

austeni Smith

1894 Smith, Ann. Mag. Nat. Hist. (6) Vol. 14, pp. 272-273. (Hab. Rumbang, Sarawak).

1895 Smith, Proc. Zool. Soc. London, p. 118, pl. 4, fig. 22. (Hab. Rumbang, Sarawak).

1902 Kobelt, Tierreich, p. 415. (Hab. Rumbang, Sarawak).

1908 Martens, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 257. (Hab. Sarawak).

baritense Smith

1894 Smith, Journ. Linn. Soc. Zool. Vol. 24, p. 347, pl. 25, fig. 15, 15a. (Hab. Barit Mountain, N.W. Borneo).

1894 Smith, Ann. Mag. Nat. Hist. (6) Vol. 14, p. 271. (Hab. Barit Mountain, N.W. Borneo).

1902 Kobelt, Tierreich, p. 415. (Hab. Berge von Barit, N. Borneo).

1908 Martens, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 257.

beddomei Smith

1904 Smith, Proc. Malac. Soc. Vol. 6, p. 105. (Bidi Mts., Sarawak).

busauense Smith

1894 Smith, Journ. Linn. Soc. Zool. Vol. 24, p. 348, pl. 25, fig. 16, 16a. (Hab. Busau, N.W. Borneo).

1894 Smith, Ann. Mag. Nat. Hist. (6) Vol. 14, p. 271. (Hab. Busan (sic!) N.W. Borneo).

1902 Kobelt, Tierreich, p. 415. (Hab. Busan (sic!) N.W. Borneo).

1908 Martens, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 257. (Hab. Sarawak).

concinnum Fulton

1901 Fulton, Ann. Mag. Nat. Hist. (7) Vol. 8, p. 242. (Hab. N. Borneo).

1902 Kobelt, Tierreich, p. 418. (Hab. Gomanton, N. Borneo).

1908 Martens, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 258. (Hab. Kinabalu).

cookei Smith (= *sarawacense* Gredler)

1894 Smith, Ann. Mag. Nat. Hist. (6) Vol. 14, pp. 271-272. (Hab. Sarawak).

1895 Smith, Proc. Zool. Soc. London, p. 118, pl. 4, fig. 20. (Hab. Sarawak).

1902 Kobelt, Tierreich, p. 416. (Hab. Sarawak).

1908 Martens, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 257. (Hab. Sarawak).

decrespignyi (H. Adams)

1865 H. Adams, Ann. Mag. Nat. Hist. (3) Vol. 15, p. 177. (*Plectostoma*) (Hab. Labuan).

1874 Issel, Ann. Mus. Civ. St. Nat. Vol. 6, pp. 439 and 482, pl. 6, fig. 11-15. (*Plectostoma*) (Hab. Labuan, Borneo).

1888 Tenison-Woods, Proc. Linn. Soc. N.S.W. (2) Vol. 3, p. 1071 (*crespignyi*) (Labuan, Borneo).

1889 Godwin-Austen, Proc. Zool. Soc. London, p. 350.

1894 Smith, Ann. Mag. Nat. Hist. (6) Vol. 14, p. 270. (Hab. Labuan, Borneo).

1902 Kobelt, Tierreich, p. 416, fig. 91. (Hab. Labuan, Borneo).

1908 Martens, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 257. (Hab. Labuan).

depauperatum Smith

1894 Smith, Ann. Mag. Nat. Hist. (6) Vol. 14, p. 272. (Hab. Barit Mountain).

1895 Smith, Proc. Zool. Soc. London, p. 118, pl. 4, fig. 21. (Hab. Barit Mountain).

1902 Kobelt, Tierreich, p. 416. (Hab. Berge von Barit).

1908 Martens, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 257.

everetti Smith

1894 Smith, Journ. Linn. Soc. Zool. Vol. 24, pp. 346-347, pl. 25, fig. 12, 12a. (Hab. Jambusan, N.W. Borneo).

1894 Smith, Ann. Mag. Nat. Hist. (6) Vol. 14, p. 271. (Hab. Jambusan, N.W. Borneo).

1902 Kobelt, Tierreich, p. 416. (Hab. Jambusan, N.W. Borneo).

1908 Martens, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 257. (Hab. Sarawak).

fraternum Smith

1905 Smith, Ann. Mag. Nat. Hist. (7) Vol. 15, p. 360. (Hab. N. Borneo).

1908 Martens, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 257. (Hab. Kinabalu).

grandispinosum Godwin-Austen

1889 Godwin-Austen, Proc. Zool. Soc. London, p. 350, pl. 38, fig. 2, 2a. (Hab. Niah Hills).

1892 Crosse, Journ. de Conch. Vol. 40, p. 283, pl. 4, fig. 1-1c. (*Geothauma*) (Hab. Borneo).

1894 Smith, Ann. Mag. Nat. Hist. (6) Vol. 14, p. 270. (Hab. Niah Hills, Sarawak).

1902 Kobelt, Tierreich, p. 418. (Hab. Niah Berge, Sarawak).

1908 Martens, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 258. (Hab. Labuan).

hosei Godwin-Austen

1890 Godwin-Austen, Ann. Mag. Nat. Hist. (6) Vol. 6, p. 246, pl. 7, fig. 2. (Hab. N. Borneo).

1894 Smith, Ann. Mag. Nat. Hist. (6) Vol. 14, p. 271. (Hab. Baram District, N. Sarawak).

1898 Kobelt, Abh. Senckenb. Vol. 24, p. 39. (Hab. Baram Fluss).

1902 Kobelt, Tierreich, pp. 416-417. (Hab. Baram Distrikt, N. Borneo).

1908 Martens, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 257. (Hab. Sarawak).

jucundum Smith

1894 Smith, Journ. Linn. Soc. Zool. Vol. 24, p. 347, pl. 25, fig. 13, 13a. (Hab. Mantanani Is., N. Borneo).

1894 Smith, Ann. Mag. Nat. Hist. (6) Vol. 14, p. 271. (Hab. Mantanani Is., N. Borneo).

1902 Kobelt, Tierreich, p. 417. (Hab. Mantanani Insel, N. Küste von Borneo).

- 1908 Martens, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 257
(Hab. Kinabalu).

linteræ Sowerby

- 1896 Sowerby, Ann. Mag. Nat. Hist. (6) Vol. 17, p. 94. (Hab. N. Borneo).

- 1902 Kobelt, Tierreich, pp. 418-419. (Hab. Sarawak).

- 1908 Martens, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 258.
(Hab. Sarawak).

mirabile Smith

- 1894 Smith, Journ. Linn. Soc. Zool. Vol. 24, p. 346, pl. 25, fig. 11,
11a. (Hab. Gomanton Hill, N. Borneo).

- 1894 Smith, Ann. Mag. Nat. Hist. (6) Vol. 14, p. 271. (Hab. Gomanton Hill, N. Borneo).

- 1898 Kobelt, Abh. Senckenb. Vol. 24, pp. 38-39. (Hab. Baram Fluss).

- 1902 Kobelt, Tierreich, p. 419, fig. 92. (Hab. Gomanton, N. Borneo).

- 1908 Martens, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 258. (Hab. Kinabalu).

otostoma Boettger

- 1893 Boettger, Nachrichtsb. Vol. 25, pp. 194-195. (Hab. Brunei, N.W. Borneo).

- 1894 Smith, Ann. Mag. Nat. Hist. (6) Vol. 14, p. 271. (Hab. Brunei, N.W. Borneo).

- 1895 Smith, Proc. Zool. Soc. London, p. 118, pl. 4, fig. 19.
Busau, Brunei).

- 1902 Kobelt, Tierreich, p. 417. (Hab. Brunei, N. Borneo).

- 1908 Martens, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 258.
(Hab. Sarawak).

picsingense Smith

- 1905 Smith, Proc. Malac. Soc. Vol. 6, p. 190, fig. 1. (Hab. Picsing, Upper Sadong, Sarawak).

- 1908 Martens, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 258.
(Hab. Sarawak).

pulchellum Godwin-Austen

- 1890 Godwin-Austen, Ann. Mag. Nat. Hist. (6) Vol. 6, p. 245,
pl. 7, fig. 1. (Hab. Baram).

- 1894 Smith, Ann. Mag. Nat. Hist. (6) Vol. 14, p. 270. (Hab. Baram, Mulu, Tampasang, Barit Mountain).

- 1902 Kobelt, Tierreich, p. 419. (Hab. Baram Distrikt, N. Borneo).

- 1908 Martens, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 258.
(Hab. Sarawak).

pumilio Smith

- 1894 Smith, Ann. Mag. Nat. Hist. (6) Vol. 14, p. 273. (Hab. Rumbang, Sarawak).

1895 Smith, Proc. Zool. Soc. London, p. 118, pl. 4, fig. 23.
(Hab. Rumbang).

1902 Kobelt, Tierreich, p. 417. (Hab. Rumbang, Sarawak).

1908 Martens, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 258.
(Hab. Sarawak).

sadongense Smith

1905 Smith, Proc. Malac. Soc. Vol. 6, p. 189, fig. 2. (Hab.
Picsing, Upper Sadong, Sarawak).

1908 Martens, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 258.
(Hab. Sarawak).

sarawacense Gredler (= *cookei* Smith)

1902 Gredler, Nachrichtsbl. Vol. 34, p. 57-58. (Hab. Niah,
Distrikt Baram).

shelfordi Smith

1905 Smith, Proc. Malac. Soc. Vol. 6, p. 189, fig. 3. (Hab.
Picsing, Upper Sadong, Sarawak).

1908 Martens, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 258.
(Hab. Sarawak).

simplex Fulton

1901 Fulton, Ann. Mag. Nat. Hist. (7) Vol. 8, p. 243. (Hab.
N. Borneo).

1902 Kobelt, Tierreich, p. 417. (Hab. Gomanton, N. Borneo).

1908 Martens, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 258.
(Hab. Kinabalu).

smithi Fulton

1901 Fulton, Ann. Mag. Nat. Hist. (7) Vol. 8, p. 243. (Hab.
N. Borneo).

1902 Kobelt, Tierreich, p. 417. (Hab. Banguay Insel, N. Borneo).

1908 Martens, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 258.
(Hab. Kinabalu).

tiesenhauseni Gredler

1902 Gredler, Nachrichtsbl. Vol. 34, pp. 58-59. (Hab. Niah,
Distrikt Baram).

wallacei (Ancey)

1887 Ancey, Bull. Soc. Malac. France, p. 276. (*Plectostoma*)
(Hab. Borneo).

1894 Smith, Journ. Linn. Soc. Zool. Vol. 24, p. 347, pl. 25, fig. 14,
14a. (Hab. Busau, N.W. Borneo).

1894 Smith, Ann. Mag. Nat. Hist. (6) Vol. 14, p. 270. (Hab.
Borneo, Busau, W. Sarawak).

1902 Kobelt, Tierreich, pp. 414-415, fig. 90. (Hab. Borneo).

1908 Martens, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 257.
(Hab. Sarawak).

What *O. præclara* Bttg. is like, I am not able to discover. Two specimens from Banguay Is. are in the Zoological Museum at Amsterdam. Perhaps it is only a manuscript name; at least I have not seen it mentioned in literature.

From a zoogeographical point of view it is interesting that quite recently two species of *Opisthostoma* have been found in Java, the first records of the genus in this island.

The shells were obtained on Mount Tjibodas (Estate of Tjampea) near Buitenzorg, at an altitude of about 300 m. This little mountain, clad with virgin forest, rises rather steeply from the surrounding plains and is composed of carbonate of lime in contradistinction to the weathered igneous rock formation of its environs.

Along nearly perpendicular walls I collected some mould to be examined afterwards in the laboratory by means of a binocular lens. In this way I succeeded in discovering 52 specimens of *Opisthostoma* belonging to two different species, mostly dead, it is true, but perfectly fresh.

Descriptions of the species, both of which proved to be new to science, are given below, illustrated by figures representing side, top and base view, drawn by a native artist.

OPISTHOSTOMA (OPISTHOSTOMA) URANOSCOPIA n.sp.

(Fig. 1, a, b, c).

Shell dextral, obliquely cylindrical, with the last whorl ascending towards the aperture, the mouth consequently being turned upwards. Uniformly white or pale pink, opaque. Apical whorl smooth, the others ornamented with oblique costulations which become more projecting and more distant as growth proceeds. Whorls 4, convex, the apical and second ones very small and depressed, hardly projecting from a side view of the shell; third and fourth forming a short oblique cylinder. Last whorl slightly constricted at the commencement of the deviation in coiling. Suture deep. Aperture trumpetshaped, subangularly circular, turned upwards, lying in a nearly horizontal plane. Peristome continuous, double, the final rim broad and a little dilated, especially towards the side of the shell; here it covers the penultimate whorl, reaching to the suture which separates the second from the third whorl. Umbilicus oval, not concealed by the last whorl.

Operculum horny, translucent, indistinctly paucispiral, with a nearly central nucleus. (Fig. 2).

Dimensions; Diam. maj. 1.2 mm. Alt. 0.8 mm.

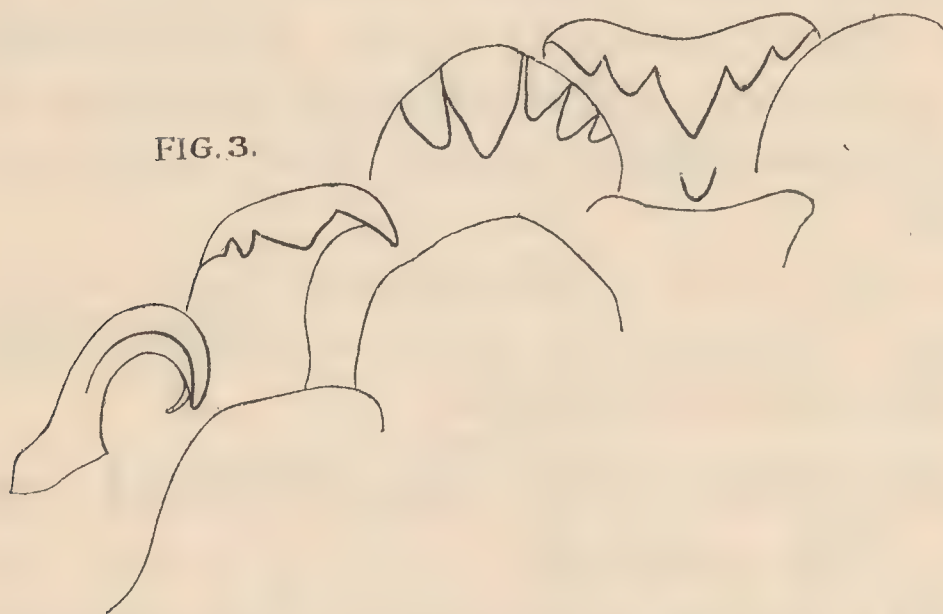
„ min. 0.7 mm. Diam. apert. 0.5 mm.

Operculum, diam. 0.27 mm.

Animal minute and generally extruding very little from the shell. The latter is borne in the reversed position with the top downward. Colour of the whole animal white, translucent. Tentacles two, hyaline, slender, bearing at their outside base the sessile eyes, appearing as black specks. When the snail is crawling the narrow foot does not project beyond the shell behind.

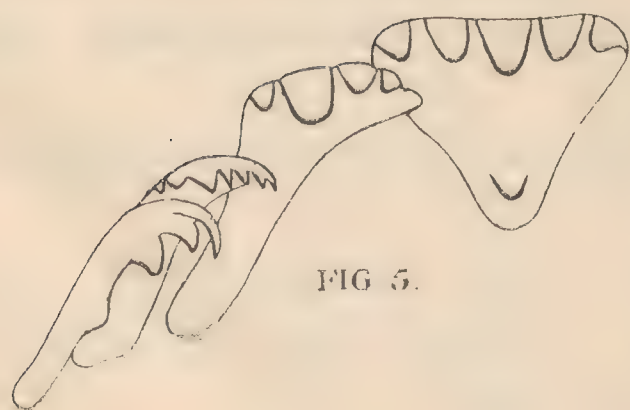
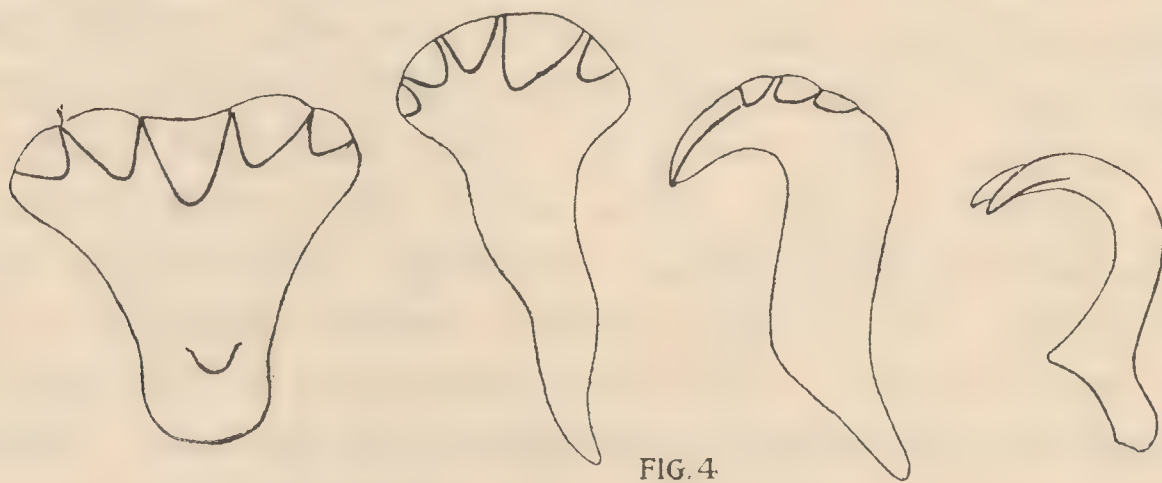
From two specimens I made microscopical preparations of the radula. It consists of about 46 transverse rows, bearing 7 teeth in every row (2. 1. 1. 1. 2).

A radula of *Opisthostoma* had never been described before. The accompanying figures of half a row of teeth and of some isolated elements may serve to illustrate these few notes. (Fig. 3 and 4).



The rhachis bears 5 cusps on the cutting edge and a median cusplike prominence near the base. Laterals provided with 5 cusps, the fourth one outward being strongest. Inner marginals bear 3 cusps or 4 if one counts a very weak

knob also as such. Outer marginals sickle-shaped. At their free edge I could detect only 2 cusps, but the whole thing is so extremely minute that some details might have escaped my notice.



As the genus *Diplommattina* stands close to *Opisthostoma* I made a radula preparation from a representative of that genus also (Fig. 5 and 6). On comparing the two it is evident that they show a strong likeness.



FIG. 6.

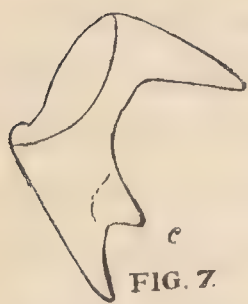


FIG. 7.

Both have the single central cusp at the base of the rhachis which is especially clear in a side view of the tooth (Fig. 7). Laterals and inner marginals are practically not different. Only the outer marginals bear more cusps in *Diplommatina* than in *Opisthostoma*.¹

Hab. Goenoeng Tjibodas (Estate of Tjampea) near Buitenzorg, Java, 300 m. alt., 1930-1931, coll. T. van Benthem Jutting, 41 specimens.

The species is related to *O. distortum* Beddome (British India) but is sufficiently distinct to stand as a new species.

OPISTHOSTOMA (OPISTHOSTOMA) JAVANICA n.sp.
(Fig. 8, a, b, c, d).

Shell dextral, irregularly cylindrical with the last whorl first ascending and then turning backwards about half a turn. Uniformly pink or white, opaque. Top projecting, but blunt. Apical whorl and part of second one smooth, the others ornamented with relatively strong, oblique costulations, regularly distributed with rather wide intervals throughout the whole surface or close to each other in the beginning, becoming more distant as growth proceeds. Whorls $4\frac{1}{2}$, convex, apical whorl and first part of second one placed with a slight excentric deflection on the axis of the following whorls. In some specimens even the third one in its turn makes again a faint angle with the fourth. Whorls 1 and 2 slightly but distinctly exserted, thus being visible in a side view of the shell. Penultimate whorl in most cases a little larger than the following one. Last whorl slightly constricted at the commencement of the deviation in coiling. Suture deep. Aperture trumpetshaped, subangularly circular, turned backward, lying in a vertical plane or nearly so. Peristome continuous, double, the final rim broad and a little dilated, especially towards the side of the shell. Here it is fixed to the third whorl. Umbilicus subcircular to oval, not concealed by the last whorl. Operculum unknown.

1. Compare also Rensch, Zool. Jahrb. (Syst.) Vol. 61, 1931, p. 386, fig. 11.

Dimensions: Diam. maj. 1.3 mm. Alt. 0.9 mm.

„ min. 0.8 mm. Diam. apert. 0.5 mm.

Hab. Goenoeng Tjibodas (Estate of Tjampea) near Buitenzorg, Java, 300 m. alt., 1930-1931, coll. T. van Benthem Jutting. 11 specimens. The species is related to *O. perakensis* Godwin-Austen & Nevill and to *O. paulucciæ* Crosse & Nevill, but cannot be assimilated with either of the two.

2. ON THE GENUS *GYLIOTRACHELA* TOMLIN AND ITS REPRESENTATIVES IN THE MALAY ARCHIPELAGO.

In the same region, the limestone hills of Goenoeng Tjibodas¹ (Estate of Tjampea) near Buitenzorg, where I found the *Opisthostomas* described above, I came upon another curious little shell which had only once before been recorded from Java. This is the trumpet-mouthed *Gyliotrachela fruhstorferi* created as *Hypselostoma fruhstorferi* by Möllendorff in 1897 (Nachrichtsbl. vol. 29, pp. 70-71).

Somewhat later I found the same species also on Mount Pawon, near Padalarang, West Java, at an altitude of circa 600 m. This is a limestone hill of analogous formation to Mount Tjibodas.

From the Dutch East Indies only three species of *Gyliotrachela* are known, viz:

everetti Smith, Ann. Mag. Nat. Hist. (6) Vol. 18, 1896, p. 148, pl. 10, fig. 9-9b. (Hab. Kalao Is.)

fruhstorferi Möllendorff, Nachrichtsbl. Vol. 29, 1897, pp. 70-71. (Hab. Java).

dohertyi Fulton, Proc. Malac. Soc. Vol. 3, 1899, pp. 215-216, pl. 11, fig. 17. (Hab. Timorlaoet).

Yet it may be expected that further research will bring to light other forms, the study of these smaller snails having been neglected generally.

In the said localities I found scores of individuals crawling on the damp rocks, probably feeding on minute algæ. Most of the shells were covered by small clumps of agglutinated earth, thus hiding their real shape.

An analogous mode of life was observed by Smith (l.c.) for *G. everetti* and figured in his pl. 10, fig. 9.

1. In order to give an idea of the very rich mollusc fauna of this small area I made up a preliminary list of the species collected. The identifications are unfortunately still in a very imperfect state, but the estimate of the number of species is at any rate on the careful side of the balance. *Semperula maculata* (Templeton), *Helicarion* sp., *Microparmarion* sp., *Hemiplecta* at least 2 spp., *Kaliella* sp., *Lamprocystis* sp., *Trochomorpha* sp., *Plectotropis* sp., *Chloritis crassula* (Philippi), *Amphidromus porcellanus* (Mousson), *Opeas gracile* (Hutton), *Prosopeas acutissimum* (Mousson), *Gyliotrachela fruhstorferi* (Möllendorff), *Cyclophorus perdix* (Broderip & Sowerby), *Opisthoporus corniculum* (Mousson), *Japonia* sp., *Lagochilus* sp., *Alycæus crenilabris* Möllendorff, *Alycæus jagori* Pfr., *Pupina treubi* Böttger, *Pupina bipalatalis* Böttger, *Diplommatina* 2 spp., *Opisthostoma uranoscopia* n.sp., *Opisthostoma javanica* n.sp., *Georissa javanica* Möllendorff.

The accompanying illustrations of *G. fruhstorferi* (Fig. 9, a-e), drawn by a native artist of the Museum, are the first ones ever published of the Javanese species.

3. SYNOPSIS OF THE SPECIES OF *Succinea* IN THE MALAY ARCHIPELAGO TOGETHER WITH A FEW NEW RECORDS.

The study of Succineids of the Malay Archipelago has always been a matter of little interest and much confusion. Our knowledge suffers first of all from scarceness of material, for, contrary to conditions in Europe, species of *Succinea* are far from abundant in Malaysia. During my own collecting experience, comprising Java only, it struck me that apparently very suitable localities, borders of sawahs, ponds and lakes in the lowlands, seldom provide any *Succinea*, whereas curiously enough most of the material was collected at a certain elevation above the sea, even to circa 2300 m. altitude. Judging from some scattered remarks in literature previous authors have come to analogous conclusions.

Another difficulty in *Succinea* systematics is how to describe adequately the external features of the shell and its different parts, there being so few characteristics in the representatives of this genus which may serve as a sound and firm basis for discrimination and comparison.

The two factors just mentioned easily induced authors to introduce as new anything in the way of Malayan *Succinea* that came into their hands without regard to what had already been done.

Consequently it may happen that of the 13 species which so far have been described from the Archipelago two or more will prove to be synonymous. Buitenzorg, however, is not the proper place to carry out such an investigation, far as it is from European museums and libraries.

The only thing I can do here is to give a list of the supposed species of *Succinea* in the Malay Archipelago, together with a few new records.

borneensis Pfeiffer

1853 Pfeiffer, Monogr. Helic. Vol. 3, p. 11. (Hab. Borneo).

1867 Martens, Ostas. Landschn. p. 388. (Hab. Borneo).

1874 Issel. Ann. Mus. Civ. St. Nat. Vol. 6, pp. 417-418. (Hab. Borneo).

1888 Tenison-Woods, Proc. Linn. Soc. N.S.W. (2) Vol. 3, p. 1057. (Hab. Borneo).

1892 Martens, Erg. Weber, Vol. 2, p. 252. (Hab. Borneo).

1908 Martens, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 263. (Hab. Borneo).

celebica Bollinger

- 1918 Bollinger, Revue Suisse Zool. Vol. 26, pp. 336-337, pl. 11, fig. 10. (S. Celebes).

decussata Möllendorff

- 1892 Möllendorff, Nachrichtsbl. Vol. 24, pp. 99-100. (Hab. Timorlaoet).
 1911 Ehrmann, Sitz. Ber. naturf. Ges. Leipzig, Vol. 38, p. 35 and p. 67. (Hab. Timorlaoet).

gracilis Lea

- 1841 Lea, Proc. Amer. Philos. Soc. Vol. 2, p. 31. (Hab. Java?)
 1867 Martens, Ostas. Landschn. p. 387. (Hab. Java?)
 1888 Tenison-Woods, Proc. Linn. Soc. N.S.W. (2) Vol. 3, p. 1058. (Hab. Java?)
 1892 Martens, Erg. Weber, Vol. 2, p. 252. (Hab. Java?)
 1914 Leschke, Mitt. naturh. Mus. Hamburg, Vol. 31, p. 240. (Hab. Java).
 1929 v. B. Jutting, Treubia, Vol. 11, p. 81. (Hab. Java).

javanica Schepman

- 1912 Schepman, Proc. Malac. Soc. Vol. 10, p. 235, pl. 10, fig. 12 and 13. (Hab. Java).
 1914 Leschke, Mitt. naturh. Mus. Hamburg, Vol. 31, p. 240. (Hab. Java).
 1928 v. B. Jutting, Treubia, Vol. 10, p. 158. (Hab. Soemba).
 1929 v. B. Jutting, Treubia, Vol. 11, p. 81. (Hab. Central Java).
 Telaga Dringoe, 2100 m. alt., 7. viii, 1930 (Fig. 10) and
 Tegal Pangonan, 2200 m. alt., 10. viii, 1930 both on Dieng
 Plateau, Central Java; Goenoeng Ipis, 2300 m. alt., 4. v.
 1930, West Java (Fig. 11); Krakatau Is. 150 m. alt., 1. iii. 1931.

listeri Smith

- 1888 Smith, Proc. Zool. Soc. London, p. 537. (Hab. Christmas Is.)
 1900 Smith, Monogr. Christmas Is. p. 57, pl. 8, fig. 12 and 13. (Hab. Christmas Is.)

Pamekasan in Madoera.

This species is a new record for the Archipelago. The 2 specimens from Pamakasan agree so perfectly well with the above quoted description and figure in the Christmas Island Monograph that I do not hesitate to bring them under that species. Under favourable light there is to be seen a faint trace of criss-cross structure on one of the shells. (Fig. 12).

minuta Mousson

- 1864 Mousson in Zollinger, Petermann's Mitt. p. 303. (Hab. Bali).
 1867 Martens, Ostas. Landschn. p. 388. (Hab. Bali).
 1888 Tenison-Woods, Proc. Linn. Soc. N.S.W. (2) Vol. 3, p. 1058. (Hab. Bali).

- 1892 Martens, Erg. Weber, Vol. 2, p. 255. (Hab. Bali).
 1929 Menzel & Tengwall, Arch. Rubber, Vol. 13, p. 243. (Hab. East Java).

monticula Semper

- 1873 Philipp. Landmoll, Vol. 2, p. 110. (Hab. Satpat, Luzon Is.)
 1898 Möllendorff, Abh. naturf. Ges. Görlitz, Vol. 22, p. 156. (Hab. Luzon, P. I.)
 1930 Faustino, Philipp. Journ. Sci. Vol. 42, p. 151. (Hab. Luzon, P.I.)

obesa Martens

- 1867 Martens, Ostas. Landsch. p. 387, pl. 22, fig. 21. (Hab. East Java).
 1888 Tenison-Woods, Proc. Linn. Soc. N.S.W. (2) Vol. 3, p. 1057. (Hab. East Java).
 1892 Martens, Erg. Weber, Vol. 2, p. 252. (Hab. Java).
 1899 Dautzenberg, Ann. Soc. Roy. Malac. Belg. Vol. 34, p. 7. (Hab. Indrapoera, Sumatra).
 1914 Leschke, Mitt. naturh. Mus. Hamburg, Vol. 31, p. 240. (Hab. East Java).
 1928 Degner, Treubia, Vol. 10, p. 364. (Hab. Sumatra).
 1929 v. B. Jutting, Treubia, Vol. 11, p. 81. (Hab. East Java). Pamekasan in Madoera.

The Pamekasan specimens (Fig. 13) show a distinct criss-cross structure, a fact which so far had not been observed in this species. Now Schepman (l.c.) remarks that *S. obesa* lacks such a structure, but this conclusion, obviously based on the fact that Martens (l.c.) did not mention it, seems rather premature. In the first place Martens does not deny the presence of such a minute structure and besides he might probably have overlooked it, as it is perceptible only with a rather powerful lens (circa 20 times) and fades in older specimens just as is the case of *S. javanica* Schepman.

philippinica Möllendorff

- 1893 Möllendorff, Ber. Senckenb. p. 101, pl. 3, fig. 10. (Hab. Cebu, Leyte, Mindanao, Luzon, P.I.)
 1898 Möllendorff, Abh. naturf. Ges. Görlitz, Vol. 22, p. 156. (Hab. Luzon, Samar, Leyte, Cebu, Bohol, Negros, Mindanao, P.I.)
 1930 Faustino, Philipp. Journ. Sci. Vol. 42, p. 151. (Hab. Luzon, Cebu, Mindanao, P.I.)

solidula Pfeiffer

- 1849 Pfeiffer, Proc. Zool. Soc. London, p. 134.
 1887 Smith, Proc. Zool. Soc. London, p. 518, fig. 1 and 2. (Hab. Christmas Is.)

- 1900 Smith, Monogr. Christmas Is. p. 56, pl. 8, fig. 8 and 9.
(Hab. Christmas Is.)

solitaria Smith

- 1887 Smith, Proc. Zool. Soc. London, p. 518, fig. 3 and 4.
(Hab. Christmas Is.)

- 1900 Smith, Monogr. Christmas Is. pp. 56-57, pl. 8, fig. 10 and 11. (Hab. Christmas Is.)

subrugata Pfeiffer

- 1853 Pfeiffer, Monogr. Helic. Vol. 3, p. 10. (Hab. Borneo).

- 1867 Martens, Ostas. Landschn., p. 387. (Hab. Borneo).

- 1874 Issel, Ann. Mus. Civ. St. Nat. Vol. 6, p. 418. (Hab. Borneo).

- 1888 Tenison-Woods, Proc. Linn. Soc. N.S.W. (2), Vol. 3, p. 1057.
(Hab. Borneo).

- 1892 Martens, Erg. Weber, Vol. 2, p. 252. (Hab. Borneo).

- 1908 Martens, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 263.
(Hab. Borneo).

4. A FEW REMARKS ON TWO SPECIES AND ONE VARIETY OF CHIROKTISMA FROM JAVA.

Ever since 1842 and 1890 respectively two species of *Chiroktisma*, viz. *conus* Philippi and *multicarinata* Böttger, have been recorded from Java, the former as *Helix conus* (Philippi, Icones, Vol. 1, 1842, pl. 1, fig. 6), *Trochomorpha conus* (Martens, Ostas. Landschn. 1867, p. 253) or *Trochonanina conus* (Böttger, Ber. Senckenb. 1890, p. 140), the second species as *Trochonanina multicarinata* (Böttger, l.c. p. 141). It was not until 1913 however that Gude (Proc. Malac. Soc. Vol. 10, p. 390) dissociated them from these inappropriate affinities and placed them together in his new genus *Chiroktisma*. The diagnosis mentions the trochiform, imperforate shell with flattened whorls, the presence of numerous raised spiral liræ on the upper surface and the fine transverse striation on the polished base of the shell. The aperture has acute margins, not reflexed.

Every naturalist in West Java is familiar with the elder of the two species, a very handsome cone-shaped shell with flat base and high spire, with many flat whorls of dark reddish brown colour and a creamy white zone along the suture. (Fig. 14).

Specimens have been recorded from several localities in West Java: Mount Megamendoeng (800 m.) near Buitenzorg, Warangloa on Mount Salak (500 m.), Mount Karang (700 and 1000 m.), near Siteo (= lake) Goenoeng on Mount Gedeh (1100 m.), Tjisaroea near Buitenzorg (800 m.), Soekaboemi (700 m.), Mount Tjakraboeana near Tjawi (1000 m.), Mount Salak (without altitude), Palaboean (about sea level), forest of Tjiliwoeng Estate, near Poentjak Pass (1200 m.), Mount Paniisan, near Buitenzorg (600 m.).

The only localities outside West Java are the island Noesa Baron near the S. coast of East Java (Mousson, Moll. Java, 1849, p. 20) and Pegantenan in Madoera Island (specimens in Museum Buitenzorg). The latter locality however seems to me a little doubtful.

Generally speaking *Ch. conus* is confined to hilly and mountainous country, where it lives on the ground among dead leaves, mosses, mouldy logs, etc., only ascending low shrubs during very wet weather.

The other species, however, *Ch. multicarinata*, has a plainer shell, dull greyish brown, not glossy except at the base, but provided with a conspicuous sculpture of regular spiral ridges, about 8 on each whorl. The whorls themselves are more rounded than in *Ch. conus*, descending steplike as growth proceeds. In accordance with such convexity the suture is much deeper. (Fig. 15).

It is far less common than its congener, specimens having only been recorded from Tjibodas (1450 m.), Mount Gedeh and Mount Tjikorai (without altitude), Mount Tjakraboena near Tjawi (1000 m.), all situated in West Java and Pegantenan in Madoera island (specimens in Museum Buitenzorg). As was the case with the preceding species this latter record needs further confirmation.

So far these details would not have been worth mentioning were it not that I came upon a curious variety of *Chiroktisma conus* in the malacological department of the Zoological Museum at Amsterdam. Here I found among the collections of the late Mr. Schepman (after his death sold to the authorities of the Amsterdam Museum) two shells from Palaboean on the S. coast of West Java presented by Frühstorfer and labelled *Chiroktisma conus* var. *lirata* Böttger. This variety was mentioned by me in the list of the land and freshwater-mollusca from Java which was published as appendix vi of Dammerman's paper on the zoogeography of Java (Treubia, Vol. 11, 1929). At that time unfortunately I was not aware that the var. *lirata* is apparently a manuscript name only. At least when recently going through the literature more thoroughly I could not discover any publication concerning the subject and I venture to give here a description in order to fix the characteristic features of the variety and its name.

Chiroktisma conus var. *lirata* (Böttger ms.) n. var. (Fig. 16). Differs from the type in having a varying number of spiral ridges, diminishing in size from the carina upward on the whole shell and from the suture upward on every whorl.

Although the presence of this spiral sculpture reminds us of the condition in *multicarinata*, it is beyond doubt that *lirata* belongs to the *conus*-relationship because of the configuration and colouring of the shell.

It has been noticed, however, that this *lirata* sculpture may occur in different stages of development. Mousson (l.c.) and Martens (l.c.) mentioned it in their descriptions without paying further attention to it. From the material of *conus* at present before me I can easily compile a continuous series of stages from perfectly smooth specimens up to the most heavily lirated forms. Under these circumstances the value of the var. *lirata* is rather a problematic one and its limits can be extended or diminished according to personal opinion. It is perhaps advisable to apply the name for shells with a large amount of spiral striation only.

Text belonging to illustrations.

PLATE VII.

- Fig. 1. *Opisthostoma* (*Opisthostoma*) *uranoscopia* n.sp.
a. side, b. top, c. base view ($\times 25$)
- Fig. 2. *Opisthostoma* (*Opisthostoma*) *uranoscopia* n.sp.
operculum ($\times 88$)
- Fig. 8. *Opisthostoma* (*Opisthostoma*) *javanica* n.sp.
a. top view, b. base view, c. and d. side views ($\times 25$)
- Fig. 9. *Gyliotrachela fruhstorferi* (Mlldff.)
a. and d. side views, b. base view, c. aperture with teeth,
e. animal crawling ($\times 15$)
- Fig. 10. *Succinea javanica* Schepman
front and back view of shell ($\times 3$)
- Fig. 11. *Succinea javanica* Schepman
mandibula ($\times 35$)
- Fig. 12. *Succinea listeri* Smith
front and back view of shell ($\times 3$)
- Fig. 13. *Succinea obesa* Martens
front and back view of shell ($\times 3$) and detail of structure ($\times 35$)
- Fig. 14. *Chiroktisma conus* (Phil.)
side and base view of shell ($\times 4$)
- Fig. 15. *Chiroktisma multicarinata* (Bttg.)
side and base view of shell ($\times 4$)
- Fig. 16. *Chiroktisma conus* var. *lirata* (Bttg. ms.) n. var.
detail of structure ($\times 15$)

TEXT-FIGURES.

- Fig. 3. *Opisthostoma* (*Opisthostoma*) *uranoscopia* n.sp.
part of radula
- Fig. 4. *Opisthostoma* (*Opisthostoma*) *uranoscopia* n.sp.
elements of radula
- Fig. 5. *Diplommatina auriculata* Mlldff.
part of radula
- Fig. 6. *Diplommatina auriculata* Mlldff.
elements of radula
- Fig. 7. *Diplommatina auriculata* Mlldff.
rhachis of radula, side view. c. central cusp at base.



THE BRITISH MARINE MOLLUSCA.

By R. WINCKWORTH, M.A.

(Presidential Address delivered at the Annual Meeting, October 3rd, 1931).

THE real subject of my address is the revised list of British marine mollusca, which forms the appendix to these remarks, since it has commonly been observed that such a list forms an incentive to collecting; and through collecting to study. This study, apart from special zoological research, has two principal aspects: a direct one, the study of the collected material, including systematic work; and an indirect one, the study of the natural history of those animals which have been identified by collecting. In both these directions there is an abundance of work waiting to be done by amateurs as well as by professional zoologists.

The first step in the study of mollusca is taking home specimens for identification; with many of us this leads to a delight in the beauty of form, and the assembling of a collection of shells. Some writers have emphasized the utility of having a collection for reference and urged us not to spend time and money on housing it well; but whether our efforts cease with collecting or go further, I am sure that it is of importance to arrange a collection to the best advantage, so that its appearance may delight the collector and stimulate enthusiasm in others who see the collection. I should like to point out here that the collecting of marine mollusca is free from the objections urged against such collecting as big game hunting, bird shooting or the more indiscriminate forms of insect collecting; no question of inhumanity can be pressed, and I do not think it possible to over-collect to the extent of exterminating a species or even seriously affecting its abundance; while the delights of exploring many sea shores, discovering the haunts and habits of sea creatures, and of sampling the sea bottom with a dredge from a small boat bring an obvious reward.

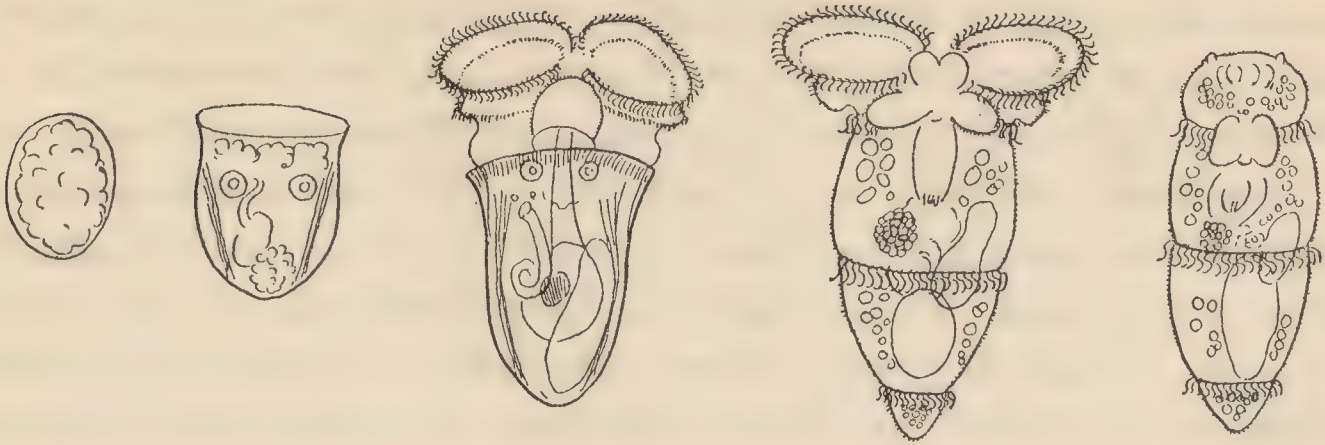
The most fascinating side of natural history is the study of living animals, their life history and their habits. The study of marine animals however presents great difficulties. In the case of littoral species, we can only observe them when the tide is out and we have at best only indirect evidence of their behaviour when the sea is over them; while our knowledge of those that live beyond low water is even more fragmentary. An aquarium to some extent bridges the gap, but with an aquarium we probably introduce conditions which may and often do cause animals to respond in ways quite different from their normal behaviour; an obvious instance is the way in which

many dredged shells from deep water will climb out of the water, when first put in an aquarium, as if they wanted a low tide, which they have never known in nature. The aquarium need not be a large one (I have kept *Lepton squamosum* alive and in health in a watch glass for over a week, and nudibranchs for many weeks in a finger bowl); it should have a large surface, proportionally, in contact with the air; the salinity may be kept nearly constant by the simple device of marking the surface level of the sea water, *e.g.*, by a piece of paper pasted at this level outside the glass, and filling up to this level with fresh water to counteract evaporation.

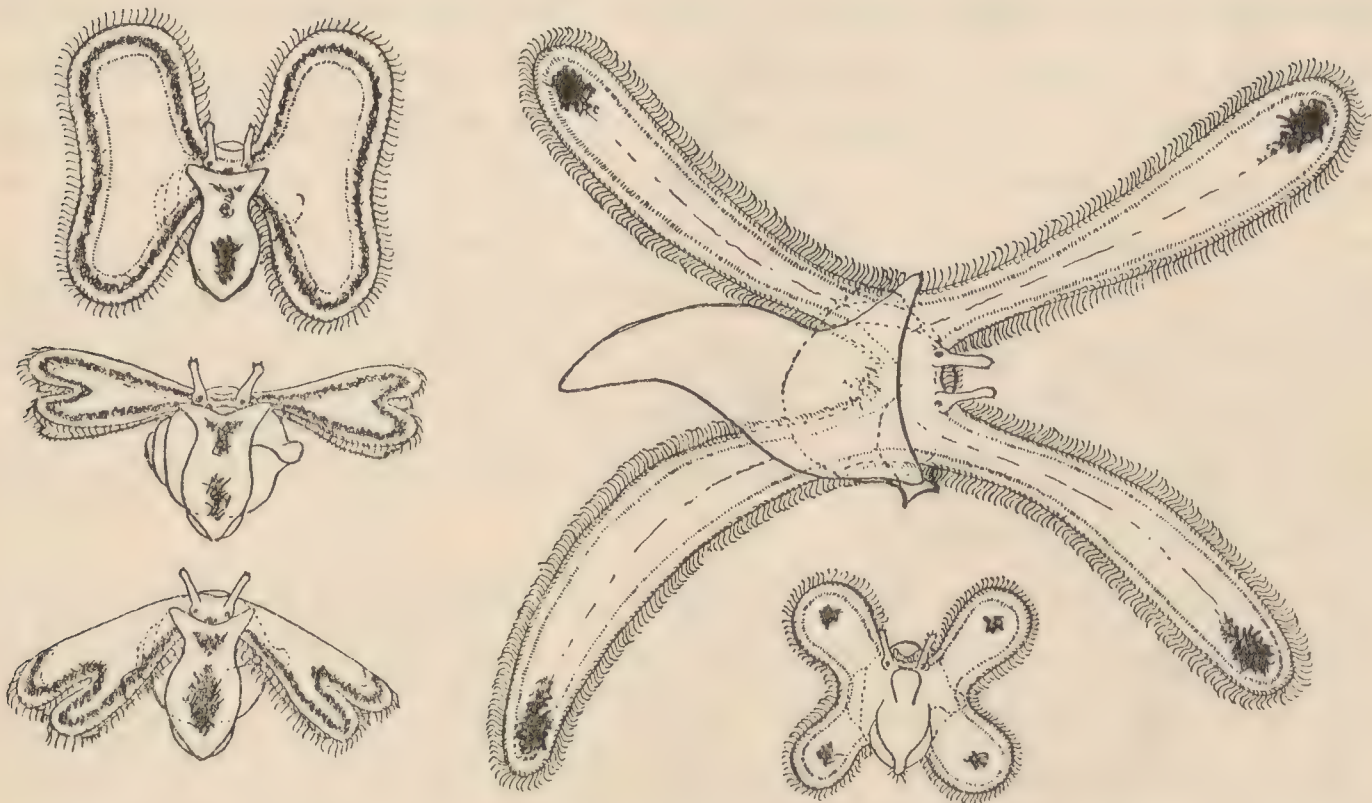
One special difficulty is that of producing in an aquarium an equivalent to the movements of the sea. In the Marine Biological Laboratory at Plymouth this has been accomplished by the plunger jar, in which a circulation of water is maintained by means of a glass plate slowly ascending and descending by clockwork. With this aid Dr. Lebour is at present conducting valuable researches on the metamorphoses of gastropods.¹ By her permission I am exhibiting to-day figures showing the development of *Clione*, *Nassarius* and *Trivia*, and I would specially direct your attention to a close study of these. This kind of research is of the highest importance to systematists, and the life histories from the egg, through the veliger to the young plantigrade or first stage of the final metamorphosis reveal many suggestive facts. *Clione* loses its shell in about a fortnight and remains planktonic, never becoming a gastropod in the literal sense. You will notice the resemblance of the veliger of *Trivia* to *Echinospira*. The two species of *Nassarius* have strikingly different veligers, and suggest a subdivision of *Nassarius* into separate genera or subgenera, but until more evidence accumulates it seems hopeless to attempt a satisfactory classification of this group and a lumping in one genus is wiser than speculation on insufficient knowledge.

Few of us conchologists, however, unless professional zoologists, have the opportunity of such fascinating research. But in outdoor observation of mollusca all of us can help and the recording of apparently trivial matters may be of great importance: the natural positions of mollusca at rest and in movement, their situation, the plants and animals they are associated with. This latter study, oecology, opens up a delightful pursuit teaching us something of all groups of marine fauna and flora. In this connexion I have exhibited a small series of well-known commensals observed at Salcombe a

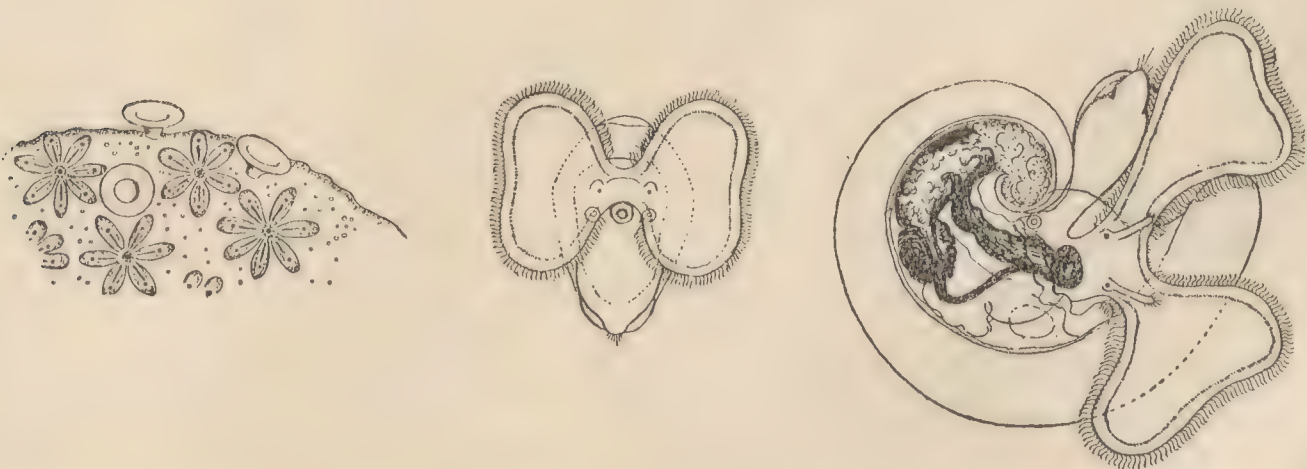
1. Three papers by her have just been published:—*Clione limacina* in Plymouth Waters, "J. Mar. Biol. Assoc.," vol. 17, pp. 785—796, 19 figs.: The larval stages of *Nassarius reticulatus* and *Nassarius incrassatus*, *ibid*, pp. 797—818, 46 figs.: The larval stages of *Trivia*, *ibid*, pp. 819—832, 45 figs.



Clione.—Egg a few hours old: newly hatched larva (animal retracted in shell): larva, 5 days old: larva at 16 days, after loss of shell: larva at 18 days, after loss of velum. [$\times 80$ approx.]



Nassarius.—Three figures on left of a veliger of *N. reticulatus* (L.), 48 days old swimming in different positions. On right, two veligers of *N. incrassatus* (Ström.) from plankton. [$\times 14$ approx.]



Trivia.—Egg capsules in *Botryllus* [$\times 2$], on left. Veliger from egg 7 days old and veliger from plankton [$\times 45$ approx.].

[Reproduced by permission from the "Journal of the Marine Biological Association," vol. 17, no. 3, October, 1931].

fortnight ago by Mr. Salisbury and myself.¹ Other associations that occur to me, ranging from suitability of habitat and colonisation of food plant to commensalism and parasitism, are neomeniids and hydroids (*Lafoea*, *Aglaophenia*), *Pteria* and *Eunicella*, *Chlamys nivea* and *Laminaria*, *Mytilus* and *Pinnotheres*, *Musculus marmoratus* and *Ascidella*, *Crepidula*, *Urosalpinx* and *Ostrea*, *Patina* and *Laminaria*, *Rissoa parva* and *Polysiphonia*, *Rissoa membranacea* and *Zostera*, *Odostomia eulimoides* and *Pecten*, *Odostomia scalaris* and *Mytilus*, *Cerithiopsis* and *Ficulina*, *Tectura virginea* and *Melobesia*, *Velella* and *Janthina*, *Trivia* and *Botryllus*, *Simnia* and *Alcyonium*, *Stilifer* and *Psammechinus*, the numerous associations between nudibranchs and coelenterates, and the many cercarian parasites recorded from British mollusca.

Another line of study open to the collector not armed with special knowledge or special opportunity is conchometry; it should be possible from bulk collecting and collated measurements to obtain valuable natural knowledge, especially in relation to variation and to growth. A good deal of work of this kind has been done on oysters, pearl oysters, windowpane shells, cockles, scallops, clams, mussels, *Chiton*, *Urosalpinx*, etc., mostly species of economic value; but many other shellfish, of no commercial importance, which can be easily collected, may yield more important scientific results to those who are not averse to arithmetic.

I have been fortunate in living most of my life by the sea and for twenty years kept a record of most spring tides and what I saw; but others have less opportunity for a direct study of marine mollusca, and like myself, now that I am a Londoner, fall back on an equally fascinating study, that of shell form or Conchology in its limited sense. If we are still able to obtain the whole animal, the study of the radula in gastropods and of the gill in bivalves deserve special attention from a systematic standpoint, since they most readily afford a morphological test of our judgment of shell form. With more leisure, the whole of the coarse anatomy repays study; a serious attempt to justify also by morphological differences our list of species, now differentiated mainly by shell form, would be a monumental contribution to our science. The pitfalls are numerous; a wide variation in individuals, different physiological conditions and distortion in preserved material, that sometimes completely masks form, all add to the practical difficulties of such work. As an example of distortion let me instance some of the eolids, e.g., *Cratena*, with smooth rhinophores that may become wrinkled in spirit so as to resemble the ringed rhinophores of *Facelina*.

1 c.f. Proc. Malac. Soc., vol. 16, p. 1 (1924).

Mr. H. B. Moore of the Marine Biological Station at Port Erin has this year published a preliminary note in "Nature"¹ of a new line of research which is likely to prove of much more importance to systematists and geologists than is at first apparent. His studies show, so far, that each species has a fairly constant form of fæces, and in many cases the fæces are marked by the intestinal cilia with distinct grooves that offer a ready identification of closely related species in *Nucula* for example. In many cases the examination is a simple observation under a strong lens of a section cut with a penknife; in others more delicate handling and more refined methods are essential.

In conchology as in every other branch of science the old ground requires a re-survey with fuller knowledge as new lines of enquiry are opened up. But whether we have opportunity for extended research and natural observation or not, there always remains for the collector of shells, the pleasure of admiring and studying some of the most beautiful and easily preserved marvels of nature.

I wish to make a few observations in connexion with the list of British Marine Mollusca that follows. The binomial system is man-made and while it attempts to represent natural facts it is in effect a sort of zoological shorthand to clarify our ideas and simplify our references to animals. In some cases species are clearly defined natural groups of individuals; in others, owing partly to our imperfect knowledge, especially to the absence of genetic data, and partly to nature, which does not necessarily draw a sharp line in time or space, groups of closely allied animals may be lumped as one variable species or separated as closely related species or as forms often referred to as races, though the name is to be deprecated where no genetic evidence is available. In the absence of sufficient knowledge and understanding it is best to admit frankly that for practical purposes a species is a group of animals it is convenient to refer to under one name; and the simplest practical test for a species is to assemble large numbers and try to determine whether they fall into one or more clearly separable groups. Hybrids, monstrosities and atavisms necessarily complicate the issue; and in the absence of sufficient specimens, one's judgment can easily be at fault. Who would dare to unite the forms *maximum* Dautzenberg and Fischer and *acuminatum* Broderip of *Buccinum undatum* L., if these were the only specimens available of the species? Such forms teach one to take a wide view of a species; but in other cases forms very closely similar prove to be definitely separable. No one thought of separating

¹ Nature, vol. 127, p. 818. Since I read this address, he has published two papers on this subject in J. Mar. Biol. Assoc., vol. 17, p. 359, and Proc. Malac. Soc., vol. 19, p. 281.

Nucula nitida Sowerby into two species until this year. Most conchologists recognize three distinct species of English limpets in the genus *Patella*; but some zoologists regard them as three physiological varieties of one species. This latter view may be expressed by adding a third name for the subspecies and terming them *Patella vulgata vulgata*, *Patella vulgata depressa* and *Patella vulgata athletica*. As I have prepared my list for conchologists I have separated them. In the case of such polymorphic groups as *Buccinum undatum* and *Littorina saxatilis*, I have added a third name, so that binomials now became trinomials. Again it is convenient in many cases to distinguish the British and Mediterranean forms of what would almost undoubtedly prove one continuously varying species through Biscayan, Portuguese and Spanish forms: here again the trinomial is useful, giving us what is often called a geographical race, e.g., what our forefathers usually called *Trochus zizyphinus*, I have called *Calliostoma zizyphinum conuloide*.

The genus may be even more artificial than the species: it is that group of species which it is convenient to put together under a common name. Here the range of individual opinion is much wider. One school of conchologists—the “splitters”—prepared by special study to see minute differences, tends to use numerous generic names; they justify themselves by asserting that too wide a use of a generic name tends to obscure the affinities of species. Their rivals—the “lumpers”—maintain that where a good specific difference has been recognized the splitters immediately elevate the species to generic rank, so that distinctions between genera and species are lost. The opposition between splitters and lumpers is partly one of mental outlook and can never be healed. I have endeavoured to steer a middle course of giving generic names as wide a meaning as possible and freely introducing subgenera. I maintain that it is of the utmost importance to the general zoologist that the meaning of genera should be kept as wide as is reasonably possible: he cannot be a specialist in all groups while the specialist may remember and if he will use the subgenera.

Thus the common top shell that lives on sea-grass I have called
***Cantharidus (Jujubinus) striatus parvus*,**
and I would advocate referring to it in general as

***Cantharidus striatus*.**

If you are concerned with the inter-relationships of the world-wide group of *Cantharidus* (all of which have closely similar radulæ) then by all means use the subgeneric name *Jujubinus*; and if you want to emphasize that it is the British and not the Mediterranean form, you may call it *parvus*. But do not call it *Jujubinus parvus* unless you are

speaking to conchologists with the same special knowledge, and in a paper that has real zoological interest and is not merely a systematic discussion, let us keep our genera at least as wide as possible that they may be understood as widely as possible.

Systematic work in so far as it is the preparation of name lists is only the alphabet of our science, but the alphabet is important, and it requires the use of every aspect of molluscan knowledge to make that alphabet a serviceable one. There is also the great hydra of literature to be wrestled with, which leads to an elaborate casuistry the difficulties and dangers of which only those who have attempted such work realize. As it is nearly thirty years since a list of British mollusca was put before the Conchological Society, I think you will admit it is time someone attempted to revise it. I have done so with much misgiving and I heartily thank all those who have encouraged me and given me help and advice.

A LIST OF THE MARINE MOLLUSCA OF THE BRITISH ISLES.

THIS list includes estuarine and littoral forms as well as truly marine mollusca recorded from depths of less than 100 fathoms.

S (Sarnian) indicates species recorded from the Channel Islands, but not from the English side of the Channel.

Q (Quærenda) indicates species which may prove to be British, but are not yet recorded from British waters, or species about which further evidence is required.

References to Forbes and Hanley's "A History of British Mollusca and their Shells" (1848-1853) and to Jeffreys' "British Conchology" (1862-1869) are indicated by the letters FH and J followed by volume number and page number. Occasional references to Sowerby's "Illustrated Index of British Shells" (1st edition 1859, 2nd edition 1887) are given as SI followed by plate and figure numbers. Where the specific name in the references FH and J differs from that proposed in this list, it is given in brackets after the reference: but for the sake of brevity, no note is made of change of generic name. Other references will be found in the notes which follow this list.

The species quoted in italics after each genus or subgenus, on the same line, is the genotype of that genus or subgenus.

Class SOLENOGASTRES.

CRYSTALLOPHRISSENTIDÆ.

CRYSTALLOPHRISSEN Möbius 1875. *C. nitens* Möbius.

1 *nitidulum* Lovén 1844.

LEPIDOMENIIDÆ.

- NEMATOMENIA** Simroth 1893. *Dondersia flavens* Pruvot.
 2 *banyulensis* (Pruvot 1890).

NEOMENIIDÆ.

- NEOMENIA** Tullberg 1875. *N. carinata* Tullberg.
 3 *carinata* Tullberg 1875.
 4 *dalyelli* (Koren & Danielssen 1877).

PRONEOMENIIDÆ.

- PRONEOMENIA** Hubrecht 1880. *P. sluiteri* Hubrecht.
 5 *aglaopheniae* Kovalevsky & Marion 1887.

Class LORICATA.

Order LEPIDOPLEURIDA.

LEPIDOPLEURIDÆ.

- LEPIDOPLEURUS** Risso 1826. *Chiton cajetanus* Poli.
 1 *asellus* (Gmelin 1791). FH2, 407. J3, 218 (*cinereus*).
 2 *cancellatus* (Sowerby 1839). FH2, 410. J3, 217.
 3 *scabridus* (Jeffreys 1880). SI25, 28.
HANLEYA Gray 1857. *Chiton hanleyi* Thorpe.
 4 *hanleyi* (Bean 1844). FH2, 398. J3, 215.

Order CHITONIDA.

LEPIDOCHITONIDÆ.

- TONICELLA** Carpenter 1873. *Chiton marmoreus* Fabricius.
 5 *marmorea* (Fabricius 1780). FH2, 414. J3, 227.
 6 *rubra* (Linné 1767). FH2, 399. J3, 224.
LEPIDOCHITONA Gray 1821. *Chiton marginatus* Pennant.
 7 *cinereus* (Linné 1767). FH2, 402. J3, 221 (*marginatus*).
CALLOCHITON Gray. *Chiton laevis* [Lowe].
 8 *achatinus* (Brown 1827). FH2, 411 and J3, 226 (*laevis*).

CRYPTOPLACIDÆ.

- ACANTHOCHITONA** Gray 1821. *Chiton fascicularis* Linné.
 9 *crinitus* (Pennant 1777). FH2, 393 and J3, 211 (*fascicularis*).
 10 *discrepans* (Brown 1827). J3, 212 (*gracilis*). SI10, 6.
 11 *communis* (Risso 1826). FH2, 396 and J3, 214 (*discrepans*).

ISCHNOCHITONIDÆ.

- ISCHNOCHITON** Gray 1847. *Chiton textile* Gray.
 S.G. **STENOSEMUS** Middendorff 1848. *Chiton albus* Linné.
 12 *albus* (Linné 1767). FH2, 405. J3, 220.

Class GASTROPODA.

Sub-class PROSOBRANCHIA.

Order ARCHÆOGASTROPODA.

HALIOTIDÆ.

- HALIOTIS** Linné 1758. *H. asinina* Linné.

S tuberculata Linné 1758. FH2, 484. J3, 279.

SCISSURELLIDÆ.

SCISSURELLA Orbigny 1824. *S. costata* Orbigny.

S.G. SCHIZOTROCHUS Monterosato 1877. *S. crispata* Fleming.

1 *crispata* Fleming 1828. FH2, 544. J3, 283.

FISSURELLIDÆ.

EMARGINULA Lamarck 1801. *E. conica* Lamarck.

[*reticulata* Sowerby 1813. Crag fossil].

2 *reticulata mülleri* Forbes & Hanley 1849. FH2, 477. J3, 259 (*fissura*).

3 *conica* Lamarck 1801. FH2, 479 & J3, 261 (*rosea*).
[*crassa* Sowerby 1813. Crag fossil].

4 *crassa anassa* Dean 1926. FH2, 481. J3, 263.

PUNCTURELLA Lowe 1827. *Patella noachina* Linné.

5 *noachina* (Linné 1771). FH2, 474. J3, 257.

DIODORA Gray 1821. *Patella apertura* Montagu.

6 *apertura* (Montagu 1803). FH2, 469 (*reticulata*). J3, 266 (*graeca*).

PATELLIDÆ.

PATELLA Linné 1758. *P. vulgata* Linné.

7 *vulgata* Linné 1758. FH2, 421. J3, 236.

8 *depressa* Pennant 1777. J3, 237 (*intermedia*).

9 *athletica* Bean 1844. FH2, 425. J3, 237 (*depressa*).

PATINA Leach 1847. *Patella laevis* Montagu.

10 *pellucida* (Linné 1758). FH2, 429. J3, 242.

11 *laevis* (Pennant 1777) FH2, 430. J3, 243.

LOTTIDÆ.

PATELLOIDA Quoy & Gaimard 1834. *P. rugosa* Q. & G.

S.G. COLLISELLA Dall 1871. *Acmaea pelta* Eschscholtz.

12 *tessulata* (Müller 1776). FH2, 434 and J3, 246 (*testudinalis*).

S.G. TECTURA Gray 1847. *Patella parva* [Montagu].

13 *virginea* (Müller 1776). FH2, 437. J3, 248.

LEPETIDÆ.

LEPETA Gray 1847. *Patella caeca* Müller.

14 *caeca* (Müller 1776). J3, 252.

15 *fulva* (Müller 1776). FH2, 441. J3, 250.

PROPILIDIUM Forbes & Hanley 1849. *Patella ancyloides* Forbes.

16 *exiguum* (Thompson 1844). FH2, 443 and J3, 254 (*ancyloide*).

TROCHIDÆ.

MARGARITES Gray 1847. *Helix margarita* Laskey.

17 *helcinus* (Fabricius 1780). FH2, 531. J3, 295.

- 18 **groenlandicus** (Gmelin 1791). FH2, 528 (*undulatus*).
J3, 298.

SOLARIELLA S. Wood 1842. *S. maculata* Wood.

- 19 **amabilis** (Jeffreys 1865). J3, 300.

CALLIOSTOMA Swainson 1840. *Trochus conulus* Linné.

[**zizyphinum** (Linné 1758). Mediterranean.]

- 20 **zizyphinum conuloide** (Lamarck 1822). FH2, 491. J3, 330.

- 21 **papillosum** (da Costa 1778). FH2, 499 and J3, 327
(*granulatus*).

- 22 **occidentale** (Mighels 1842). FH2, 497 (*alabastrum*). J3, 333.

GIBBULA Risso 1826. *Trochus magus* Linné.

[**magus** (Linné 1758). Mediterranean.]

- 23 **magus tuberculata** (da Costa 1778). FH2, 522. J3, 305.

- 24 **tumida** (Montagu 1803). FH2, 513. J3, 307.

- 25 **cineraria** (Linné 1758). FH2, 516. J3, 310.

- 26 **umbilicalis** (da Costa 1778). FH2, 519 and J3, 312
(*umbilicatus*).

- S* **pennanti** (Philippi 1851). FH2, 521 (*umbilicatus* var.)
J3, 313 (*agathensis*).

CANTHARIDUS Montfort 1810. *Trochus iris* Gmelin.

S.G. **JUJUBINUS** Monterosato 1884. *Trochus matonii* Payraudeau.

- 27 **exasperatus** (Pennant 1777). FH2, 505 (*exiguus*). J3, 324.

- 28 **montagui** (W. Wood 1828). FH2, 511. J3, 320 (*montacuti*).

[**striatus** (Linné 1758). Mediterranean.]

- 29 **striatus parvus** (da Costa 1778). FH2, 508. J3, 322.

S.G. **CLELANDELLA** Winckworth 1932. *Trochus clelandi* Wood.

- 30 **clelandi** (Wood 1828). FH2, 502 and J3, 325 (*millegranus*).

MONODONTA Lamarck 1799. *Trochus labio* Linné.

S.G. **OSILINUS** Philippi 1847. *Trochus turbinatus* Born.

- 31 **lineata** (da Costa 1778). FH2, 525. J3, 317.

SKENEA Fleming 1825. *Helix serpuloides* Montagu.

- 32 **serpuloides** (Montagu 1808). FH3, 161 (*divisa*). J3, 290.

[**nitens** (Philippi 1844). Calabrian fossil.]

- 33 **nitens pusilla** (Jeffreys 1847). FH2, 534. J3, 289.

- 34 **cutleriana** (Clark 1849). FH3, 164. J3, 287.

CYCLOSTREMATIDÆ.

CIRCULUS Jeffreys 1865. *Trochus duminyi* Requier.

- 35 **striatus** (Philippi 1836). J3, 315 (*duminyi*).

TURBINIDÆ.

TRICOLIA Risso 1826.

[**pullus** (Linné 1758). Mediterranean.]

- 36 **pullus pictus** (da Costa 1778). FH2, 538. J3, 338.

Order MESOGASTROPODA.

LACUNIDÆ.

LACUNA Turton 1827. *Nerita pallidula* da Costa.S.G. EPHERIA Leach 1847. *Turbo vinctus* Montagu.37 **vincta** (Montagu 1803). FH3, 62. J3, 346 (*divaricata*).38 **crassior** (Montagu 1803). FH3, 67. J3, 344.

S.G. LACUNA S.S.

39 **parva** (da Costa 1778). FH3, 58 and J3, 348 (*puteolus*).40 **pallidula** (da Costa 1778). FH3, 56. J3, 351.**LITTORINA** Férussac 1822. *Turbo littoreus* Linné.41 **littorea** (Linné 1758). FH3, 29. J3, 368.S.G. LITTORIVAGA Dall 1918. *Littorina sitchana* Philippi.42 **saxatilis** (Olivi 1792). FH3, 32 and J3, 364 (*rudis*).42a **saxatilis saxatilis** (Olivi 1792). J3, 365.42b **saxatilis tenebrosa** (Montagu 1803). FH3, 39. J3, 365.42c **saxatilis jugosa** (Montagu 1803). FH3, 36 (*patula*) J3, 365.42d **saxatilis patula** Thorpe 1844. J3, 365.42e **saxatilis nigrolineata** Gray 1839. FH3, 34. J3, 365 (*sulcata*).42f **saxatilis rudis** (Maton 1797). FH3, 32. J3, 364.42g **saxatilis groenlandica** Menke 1830. J3, 365 (*similis*).S.G. MELARHAPHE Menke 1828. "*Paludina glabrata* Zgl." [i.e. *neritoides*].[**neritoides** Linné 1758. Mediterranean.]43 **neritoides petraea** (Montagu 1803). FH3, 26. J3, 361.S.G. NERITOIDES Brown 1827. *Nerita littoralis* Linné.44 **aestuarii** Jeffreys 1869. J5, 205.45 **littoralis** (Linné 1758). FH3, 45. J3, 356 (*obtusata*).

HYDROBIIDÆ.

HYDROBIA Hartmann 1821. *Cyclostoma acutum* Draparnaud.46 **ventrosa** (Montagu 1803). FH3, 138. J1, 66.47 **jenkinsi** Smith 1889.S.G. PERINGIA Paladilhe 1874. *Turbo ulvae* Pennant.48 **ulvae** Pennant 1777. FH3, 141. J4, 52.**PSEUDAMNICOLA** Paulucci 1878. *Bythinia lucensis* Issel.49 **confusa** Frauenfeld 1863. FH3, 134 (*anatina*). J1, 64 (*similis*).**ACMEA** Hartmann 1821. *Cyclostoma truncatulum* Draparnaud.50 **subcylindrica** (Linné 1767). FH3, 317 (*montagui*). J4, 85 (*truncatula*).

RISSOIDÆ,

CINGULA Fleming 1818. *Turbo cingillus* Montagu.S.G. PARVISETIA Monterosato 1884. *Rissoa scillae* Aradas & Benoit.51 **fulgida** (J. Adams 1797). FH3, 128. J4, 43.

- S pulcherrima** (Jeffreys 1848). FH3, 129. J4, 42.
 52 **alderi** (Jeffreys 1858). FH3, 131 and J4, 45 (*soluta*).
 S.G. HYALA H. & A. Adams 1854. *Turbo vitreus* Montagu.
 53 **vitrea** (Montagu 1803). FH3, 125. J4, 40.
 54 **proxima** (Forbes & Hanley 1850). FH3, 127. J4, 39.
 S.G. ONOBA H. & A. Adams 1854. *Turbo striatus* Montagu.
 55 **semicostata** (Montagu 1803). FH3, 94 and J4, 37 (*striata*).
 S.G. CINGULA S.S.
 56 **semistriata** (Montagu 1808). FH3, 117. J4, 46.
 57 **cingillus** (Montagu 1803). FH3, 122. J4, 48.
ALVANIA Risso 1826. *Alvania europaea* Risso.
 S.G. MANZONIA Brusina 1870. *Turbo costatus* J. Adams.
 58 **crassa** (Kanmacher 1798). FH3, 92 and J4, 22 (*costata*).
 S.G. ALVANIA S.S.
 59 **cimicoides** (Forbes 1844). FH3, 88 (*sculpta*). J4, 14.
 60 **beanii** (Thorpe 1844).
 60a **beanii beanii** (Thorpe 1844). FH3, 84. J4, 12 (*reticulata*).
 60b **beanii calathus** (Hanley 1850). FH3, 82. J4, 11.
 61 **jeffreysi** (Waller 1864). J4, 15.
 62 **zetlandica** (Montagu 1815). FH3, 78. J4, 20.
 63 **cancellata** (da Costa 1778). FH3, 80 (*crenulata*). J4, 8.
 S.G. GALEODINA Monterosato 1884. *Turbo carinatus* da Costa.
 64 **carinata** (da Costa 1778). FH3, 73 and J4, 5 (*striatula*).
 S.G. MASSOTIA Bucquoy Dautzenberg & Dollfus 1884. *Rissoa lactea* Michaud.
S lactea (Michaud 1830). FH3, 76. J4, 7.
 S.G. ACTONIA Monterosato 1884. *Rissoa abyssicola* F. & H.
 65 **abyssicola** (Forbes & Hanley 1850). FH3, 86. J4, 19.
 66 **subsoluta** (Aradas 1847).
 67 **punctura** (Montagu 1803). FH3, 89. J4, 17.
RISSOA Desmarest 1814. *Rissoa ventricosa* Desmarest.
 S.G. TURBOELLA Gray 1847. *Turbo parvus* Montagu.
 68 **albella** Lovén 1846. FH3, 115 (*albula*). J4, 29.
 69 **sarsii** Lovén 1846. FH3, 115 (*tenuis*). J4, 29.
 70 **inconspicua** Alder 1844. FH3, 113. J4, 26.
 71 **parva** (da Costa 1778). FH3, 98. J4, 23.
 72 **guerinii** Récluz 1843. FH3, 103 and J4, 35 (*costulata*).
 S.G. RISSOA S.S.
 73 **lilacina** Récluz 1843. FH3, 106 (*rufilabrum*). J4, 33 (*violacea*).
 74 **membranacea** (J. Adams 1800).
 74a **membranacea membranacea** (J. Adams 1800). FH3, 110
 (var.). J4, 31 (*elata*).

74^b *membranacea grossa* Michaud 1830. FH3, 109 (*labiosa*).
J4, 30 (*membranacea*).

BARLEEIA Clark 1855. *Rissoa rubra* Forbes & Hanley.

75 *unifasciata* (Montagu 1803). FH3, 120 and J4, 56 (*rubra*).

ASSIMINEIDÆ.

ASSIMINEA Fleming 1828. *A. grayana* Fleming.

76 *grayana* Fleming 1828. FH3, 69. J5, 99.

PALUDINELLA Pfeiffer 1841. *Helix littorina* Chiaje.

[*littorina* (Chiaje 1828). Mediterranean].

77 *littorina globularis* (Thorpe 1844). FH3, 132 (*littorea*).
J5, 101.

TORNIDÆ.

TORNUS Turton 1830. *Helix subcarinata* Montagu.

78 *subcarinatus* (Montagu 1803). FH2, 541. J4, 231.

79 *imperspicuus* (Chaster 1895).

SKENEOPSIDÆ.

SKENEOPSIS Iredale 1915. *Turbo planorbis* Fabricius.

80 *planorbis* (Fabricius 1780). FH3, 156. J4, 65.

OMALOGYRIDÆ.

OMALOGYRA Jeffreys 1860. *Skenea nitidissima* Forbes and
Hanley.

81 *atomus* (Philippi 1841). FH3, 158 (*nitidissima*). J4, 69.

AMMONICERA Vayssière 1893. *Homalogyra fischeriana*
Monterosato.

82 *rota* (Forbes & Hanley 1850). FH3, 160. J4, 71.

83 *tricarinata* (Webster 1856).

RISSELLIDÆ.

RISSELLA Gray 1847. *Rissoa glabra* Alder.

84 *diaphana* (Alder 1848). FH3, 152. J4, 59.

S.G. **JEFFREYSINA** Thiele 1925. *Jeffreysia globularis* Forbes and
Hanley.

85 *opalina* (Jeffreys 1848). FH3, 154. J4, 60.

86 *globularis* (Forbes & Hanley 1852). FH4, 268. J4, 62.

TURRITELLIDÆ.

TURRITELLA Lamarck 1799. *Turbo terebra* Linné.

87 *communis* Risso 1826. FH3, 172. J4, 80 (*terebra*).

CÆCIDÆ.

CÆCUM Fleming 1813. *Dentalium trachea* Montagu.

88 *imperforatum* (Kanmacher 1798). FH3, 178 and J4, 75
(*trachea*).

S.G. **BROCHINA** Gray 1857. *Dentalium glabrum* Montagu.

89 *glabrum* (Montagu 1803). FH3, 181. J4, 77.

CERITHIIDÆ.

BITTIUM Leach 1847. *Murex reticulatus* Montagu.

90 **reticulatum** (da Costa 1778). FH3, 192. J4, 258.

CERITHIOPSIDÆ.

CERITHIOPSIS Forbes & Hanley 1851. *Murex tubercularis* Montagu.

91 **tubercularis** (Montagu 1803). FH3, 365. J4, 266.

92 **barleei** Jeffreys 1867. J4, 268.

93 **clarkii** Forbes & Hanley 1851. FH3, 368.

94 **jeffreysi** Watson 1885. J4, 269 (*pulchella*).

S.G. **METAXIA** Monterosato 1884. *Cerithiopsis metaxae* Monterosato.

95 **metaxae** (Chiaje) 1828. J4, 271.

CERITHIELLA Verrill 1882. *Cerithium metula* Lovén.

96 **metula** (Lovén 1846). FH3, 198. J4, 256.

EUMETULA Thiele 1912. *E. dilecta* Thiele.

S.G. **LASKEYA** Iredale 1918. *Turritella costulata* Möller.

97 **arctica** (Mörch 1875). J4, 272 (*costulata*).

TRIPHORIDÆ.

TRIPHORA Blainville 1828. *Murex perversus* Linné.

98 **perversa** (Linné 1758). FH3, 195 (*adversum*). J4, 261.

EPITONIIDÆ.

CIRSOTREMA Mörch 1852. *Scalaria varicosa* Lamarck.

S.G. **GYROSCALA** de Boury 1887. *Scalaria commutata* Monterosato.

99 **commutatum** (Monterosato 1877). J4, 98 (*pseudoscalaris*).
SI25, 37.

CLATHRUS Oken 1815. *Scalaria communis* Lamarck.

100 **clathrus** (Linné 1758). FH3, 206 and J4, 91 (*communis*).

101 **turtonis** (Turton 1819). FH3, 204. J4, 89 (*turtonae*).

102 **trevelyanus** (Johnston 1841). FH3, 213. J4, 93.

103 **clathratulus** (Kanmacher 1798). FH3, 209. J4, 96.

JANTHINIDÆ.

JANTHINA Röding 1798. *Helix janthina* Linné.

104 **britannica** Forbes & Hanley 1852. FH2, 549 (*communis*).
J4, 186 (*rotundata*).

ACLIDIDÆ.

GRAPHIS Jeffreys 1867. *Turbo unicus* Montagu 1803.

105 **albida** (Kanmacher 1798). FH3, 222 and J4, 100 (*unicus*).

ACLIS Lovén 1846. *Alvania supranitida* S. Wood.

106 **ascaris** (Turton 1819). FH3, 219. J4, 102.

107 **minor** (Brown 1827). FH3, 220 and J4, 103 (*supranitida*).

108 **walleri** Jeffreys 1867. J4, 105.

PHERUSINA Chaster 1898. *Chemnitzia gulsonae* Clark,

109 **gulsonae** (Clark 1850). FH4, 281, J4, 106.

CIMA Chaster 1898. *Odostomia minima* Jeffreys.

110 *minima* (Jeffreys 1858). J4, 115.

EULIMIDÆ.

EULIMA Risso 1826. *Turbo subulatus* Donovan.

111 *glabra* (da Costa 1778). FH3, 235 and J4, 208 (*subulata*).

112 *trifasciata* (J. Adams 1800). FH3, 237 and J4, 210 (*bilineata*).

S.G. **HALIELLA** Monterosato 1878. *Eulima stenostoma* Jeffreys.

113 *stenostoma* Jeffreys 1858. J4, 207.

BALCIS Leach 1847. *B. montagui* Leach.

114 *alba* (da Costa 1778). FH3, 229 and J4, 201 (*polita*).

Q *petitiana* (Brusina 1869).

115 *lubrica* (Monterosato 1890). FH3, 231 (*nitida*). J4, 203 (*intermedia*).

S.G. **VITREOLINA** Monterosato 1884. *Eulima incurva* Bucquoy
Dautzenberg & Dollfus.

116 *sinuosa* (Scacchi 1836).

117 *compactilis* (Sykes 1903).

118 *frielei* (Jordan 1895).

119 *anceps* (Marshall 1901).

120 *collinsi* (Sykes 1903).

121 *monterosatoi* (Monterosato 1891). FH3, 233 and J4, 205 (*gracilis*).

122 *devians* (Monterosato 1884). FH3, 232 and J4, 205 (*distorta*).

123 *curva* (Monterosato 1874).

STYLIFERIDÆ.

PELSENEERIA Köhler & Vaney 1908. *P. profunda* K. & V.

S.G. **ROSENIA** Schepman 1913. *Phasianella stylifera* Turton.

124 *stylifera* (Turton 1825). FH3, 226 and J4, 195 (*turtoni*).

ENTOCONCHIDÆ.

ENTEROXENOS Bonnevie 1902. *E. ostergreni* Bonnevie.

Q *ostergreni* Bonnevie 1902.

PYRAMIDELLIDÆ.

CHRYSTALLIDA Carpenter 1857. *Chemnitzia communis*
C. B. Adams.

S.G. **PARTHENINA** Bucquoy Dautzenberg & Dollfus 1883. *Turbo*
interstinctus Montagu.

125 *obtusa* (Brown 1827). FH3, 296 and J4, 151 (*interstincta*).

126 *indistincta* (Montagu 1808). FH3, 255. J4, 151.

127 *clathrata* (Jeffreys 1848.) FH3, 258. J4, 148.

128 *decussata* (Montagu 1803). FH3, 303. J4, 145.

129 *eximia* (Jeffreys 1849). FH4, 278. J4, 155.

- S.G. IVIDELLA Dall & Bartsch 1909. *I. navisa* Dall & Bartsch.
 [excavata (Philippi 1836). Mediterranean.]
- 130 excavata harveyi (Thompson 1840). FH3, 305. J4, 158.
- S.G. PARTULIDA Schaufuss 1869. *Turbo spiralis* Montagu.
- 131 spiralis (Montagu 1803). FH3, 299. J4, 154.
- MENESTHO Möller 1842. *Turbo albulus* Fabricius.
- S.G. NOEMIAMEA Hoyle 1886. *Odostomia dolioliformis* Jeffreys.
- 132 dolioliformis (Jeffreys 1848). FH3, 301. J4, 144.
- S.G. EVALEA A. Adams 1860. *E. elegans* A. Adams.
- 133 divisa (J. Adams 1797). FH3, 289 and J4, 139 (*insculpta*).
- 134 diaphana (Jeffreys 1848). J4, 141. SI17, 23.
- 135 obliqua (Alder 1844). FH3, 291. J4, 142.
- 136 warreni (Thompson 1845). FH3, 292. J4, 143 (var.)
- S.G. LIOSTOMIA G. O. Sars 1878. *Turbonilla clavula* Lovén.
- 137 clavula (Lovén 1846). FH3, 314. J4, 118.
- ODOSTOMIA Fleming 1813. *Turbo plicatus* Montagu.
- S.G. JORDANIELLA Chaster 1898. *Turbo nivosus* Montagu.
- 138 nivosa (Montagu 1803). FH3, 287 (*cylindrica*). J4, 116.
- 139 truncatula Jeffreys 1850. FH3, 294. J4, 117. SI17, 10.
- S.G. ODOSTOMIA S.S.
- 140 plicata (Montagu 1803). FH3, 271. J4, 137.
- 141 turrita Hanley 1844. FH3, 267. J4, 135. SI17, 2.
- 142 unidentata (Montagu 1803). FH3, 264. J4, 134. SI17, 1.
- 143 conspicua Alder 1850. FH3, 263. J4, 132. SI17, 9.
- 144 acuta Jeffreys 1848. FH3, 269. J4, 130. SI17, 3-4.
- 145 umbilicaris (Malm 1863). J4, 129. SI25, 38.
- [conoidea (Brocchi 1814). Italian Pliocene fossil.]
- 146a conoidea australis Jeffreys 1867. J4, 128.
- 146b conoidea scotica Winckworth 1932. FH3, 260. J4, 127.
 SI17, 8.
- S.G. BRACHYSTOMIA Monterosato 1884. *Odostomia rissoides*
 Hanley.
- 147 lukisii Jeffreys 1858. J4, 120.
- 148 albella (Lovén 1846). FH3, 286. J4, 121.
- 149 scalaris Macgillivray 1843. FH3, 284 and J4, 122 (*rissoides*).
- 150 eulimoides Hanley 1844. FH3, 273. J4, 124 (*pallida*).
- Q perezi Dautzenberg & Fischer 1925.
- 151 oblongula Marshall 1895.
- EULIMELLA Jeffreys 1847. *E. gracilis* Jeffreys.
- 152 macandrei (Forbes 1844). FH3, 309 and J4, 169 (*scillae*).
- 153 compactilis Jeffreys 1867. J4, 169 (var.).
- 154 laevis (Brown 1827). FH3, 311 and J4, 171 (*acicula*).
- 155 gracilis Jeffreys 1847. J4, 171 (*ventricosa*).

S.G. EBALINA Thiele 1931. *Eulimella monolirata* (Folin).

156 *nitidissima* (Montagu 1803). FH3, 223. J4, 173.

TURBONILLA Risso 1826. *T. costulata* Risso.

157 *elegantissima* (Montagu 1803). FH2, 242. J4, 164 (*lactea*).
SI16, 1.

158 *acuta* (Donovan 1804). FH3, 244 (*gracilis*). SI16, 3.

159 *innovata* Monterosato 1884. FH3, 244 and J3, 167 (*pusilla*).

160 *delicata* Monterosato 1884. SI16, 2.

Q verticalis Marshall 1900.

Q multilirata Monterosato 1878.

S.G. PYRGISCULUS Monterosato 1884. *Melania scalaris* Philippi.

161 *crenata* (Brown 1827). FH3, 247 & 4, 276 and J4, 162 (*rufa*).

162 *fulvocincta* (Thompson 1840). FH3, 247 & 4, 276. J4, 163.

163 *jeffreysii* (Forbes & Hanley 1850). FH3, 251 and J4, 160
(*scalaris*).

164 *rufescens* (Forbes 1846). FH3, 253. J4, 161.

S.G. TRAGULA Monterosato 1884. *Odostomia fenestrata* Jeffreys.

165 *fenestrata* (Jeffreys 1848). FH3, 249. J4, 156.

TRICHOTROPIDÆ.

TRICHOTROPIS Broderip & Sowerby 1829. *Turbo bicarinatus*
Sowerby.

166 *borealis* Broderip & Sowerby 1829. FH3, 361. J4, 245.

CAPULIDÆ.

CAPULUS Montfort 1810. *Patella ungarica* Linné.

167 *ungaricus* (Linné 1758). FH2, 459 and J3, 269 (*hungaricus*).

CALYPTRÆIDÆ.

CALYPTRAEA Lamarck 1799. *Patella chinensis* Linné.

168 *chinensis* (Linné 1758). FH2, 463 (*sinensis*). J3, 273.

CREPIDULA Lamarck 1799. *Patella fornicata* Linné.

169 *fornicata* (Linné 1758).

APORRHAIIDÆ.

APORRHAIS da Costa 1778. *A. quadrifidus* da Costa.

[*pespelicani* (Linné 1758). Mediterranean].

170 *pespelicani quadrifidus* da Costa 1778. FH3, 188. J4, 250.

[*serresianus* (Michaud 1828). Mediterranean].

171 *serresianus macandreae* Jeffreys 1867. FH3, 186 (*pescarbonis*).
J4, 253.

CARINARIIDÆ.

CARINARIA Lamarck 1801. *Argonauta vitrea* Gmelin.

172 *mediterranea* Blainville 1824.

NATICIDÆ.

AMAUROPSIS Mörch 1857. *Nerita islandica* Gmelin.

173 *islandica* (Gmelin 1791). FH3, 339 (*helicoides*). J4, 214.

NATICA Scopoli 1777. *Nerita canrena* Linné.

S.G. **LUNATIA** Gray 1847. *Natica ampullaria* Lamarck.

[*pallida* Broderip & Sowerby 1829. Alaska.]

174 *pallida groenlandica* Möller 1842. FH3, 341 (*pusilla*) J4, 216

175 *fusca* Blainville 1825. FH3, 334 and J4, 218 (*sordida*).

176 *catena* (da Costa 1778). FH3, 326 (*monilifera*). J4, 220.

[*poliana* Chiaje 1826. Mediterranean.]

177 *poliana alderi* Forbes 1838. FH3, 330 (*nitida*). J4, 224.

178 *montagui* Forbes 1838. FH3, 336. J4, 227.

LAMELLARIIDÆ.

VELUTINA Fleming 1822. *Bulla velutina* Müller.

179 *velutina* (Müller 1776). FH3, 347 and J4, 240 (*laevigata*).

180 *plicatilis* (Müller 1776). FH3, 350 (*flexilis*). J4, 239.

LAMELLARIA Montagu 1815. *L. tentaculata* Montagu.

181 *perspicua* (Linné 1758). FH3, 355. J4, 236.

182 *latens* (Müller 1776). FH3, 358 (*tentaculata*). J4, 237
(*perspicua*, male).

CYPRÆIDÆ.

ERATO Risso 1826. *E. cypræola* Risso.

183 *voluta* (Montagu 1803). FH3, 502 and J4, 400 (*laevis*).

TRIVIA Gray 1837. *Cypræa europæa* Montagu.

184 *monacha* (da Costa 1778). FH3, 495 and J4, 403 (*europæa*).

184a *monacha monacha* (da Costa 1778). [spotted]

184b *monacha arctica* (Montagu 1803). [unspotted]

SIMNIA Risso 1826. *Simnia nicaeensis* Risso.

185 *patula* (Pennant 1777). FH3, 498. J4, 407.

CASSIDIDÆ.

CASSIDARIA Lamarck 1816. *Buccinum echinophorum* Linné.

186 *rugosa* (Linné 1771).

CYMATIIDÆ.

CYMATIUM Röding 1798. *Murex femorale* Linné.

S.G. **CABESTANA** Röding 1798. *C. cymatium* Röding.

S *cutaceum* (Linné 1767). J4, 303.

CHARONIA Gistel 1848. *Murex tritonis* Linné.

S *lampas* (Linné 1758). J4, 301 (*nodiferus*).

Order STENOGLOSSA.

MURICIDÆ.

TROPHON Montfort 1810. *Murex magellanicus* Gmelin.

S.G. **TROPHONOPSIS** Bucquoy Dautzenberg & Dollfus. *Murex muricatus* Montagu.

187 *truncatus* (Ström 1768). FH3, 436 (*clathratus*). J4, 319.

188 *barvicensis* (Johnston 1825). FH3, 442. J4, 318.

189 *muricatus* (Montagu 1803). FH3, 439. J4, 316.

NUCELLA Röding 1798. *N. theobroma* Röding.

190 *lapillus* (Linné 1758). FH3, 380. J4, 276.

UROSALPINX Stimpson 1865. *Fusus cinereus* Say.

191 *cinerea* (Say 1822).

OCENEBRA Leach 1847. *Murex erinaceus* Montagu.

192 *erinacea* (Linné 1758). FH3, 370. J4, 306.

S.G. OCINEBRINA Jousseume 1880. *Murex corallinus* Scacchi.

193 *aciculata* (Lamarck 1822). FH3, 374 (*corallinus*). J4, 310.

PYRENIDÆ.

PYRENE Röding 1798. *P. rhombiferum* Röding.

S.G. ANACHIS H. & A. Adams. *Columbella scalarina* Sowerby.

194 *haliaeeti* Jeffreys 1867. J4, 356. SI25, 41.

BUCCINIDÆ.

LIOMESUS Stimpson 1865. *Buccinum dalei* J. Sowerby.

195 *ovum* (Turton 1825). FH3, 408 and J4, 298 (*dalei*).

BERINGIUS Scudder 1882. *Chrysodomus crebricostatus* Dall.

196 *turtoni* (Bean 1834). FH3, 431. J4, 331.

VOLUTOPSIUS Mörch 1857. *Fusus largillierti* Petit.

197 *norwegicus* (Gmelin 1791). FH3, 428 and J4, 329 (*norvegicus*).

COLUS Röding 1798. *Murex islandicus* Gmelin.

198 *islandicus* (Gmelin 1791). J4, 333. SI26, 20.

199 *gracilis* (da Costa 1778). FH3, 416 (*islandicus*). J4, 335.

S.G. SIPHONORBIS Mörch 1869. *Fusus ebur* Mörch.

200 *howsei* (Marshall 1911). FH3, 419 and J4, 338 (*propinquus*).

201 *jeffreysianus* (Fischer 1868). J4, 340 (*buccinatus*).

S.G. COLICRYPTUS Iredale 1918. *Buccinum fusiforme* Broderip.

202 *fenestratus* (Turton 1834). FH3, 412 (*fusiforme*). J4, 343.

NEPTUNEA Röding 1798. *Murex antiquus* Linné.

203 *antiqua* (Linné 1758). FH3, 423. J4, 323.

BUCCINUM Linné 1758. *Buccinum undatum* Linné.

204 *undatum* Linné 1758. FH3, 401. J4, 285.

204a *undatum littorale* King 1846. FH3, 404. J4, 286.

204b *undatum maximum* Bucquoy, Dautzenberg & Dollfus, 1912.

204c *undatum undatum* Linné 1758. FH3, 403. J4, 285.

204d *undatum pelagicum* King 1846. FH3, 405. J4, 286.

204e *undatum zetlandicum* Forbes 1835. FH3, 405. J4, 286.

205 *humphreysianum* Bennett 1824. FH3, 410. J4, 293.

CHAUVETIA Monterosato 1884. *Buccinum candidissimum* Philippi.

206 *brunnea* (Donovan 1804). FH3, 377 and J4, 313 (*minima*).

NASSARIIDÆ.

NASSARIUS Duméril 1806. *Buccinum mutabile* Linné.

S.G. HIMA Leach 1852. *Buccinum reticulatum* Linné.

207 *reticulatus* (Linné 1758). FH3, 388. J4, 346.

208 *incrassatus* (Ström 1768). FH3, 391. J4, 351.

209 *pygmaeus* (Lamarck 1822). FH3, 394. J4, 354.

FASCIOLARIIDÆ.

TROSCHELIA Mörch 1876. *Fusus berniciensis* King.

210 *berniciensis* (King 1846). FH3, 421. J4, 341.

TURRIDÆ.

HÆDROPLEURA Bucquoy Dautzenberg & Dollfus 1883.

Murex septangularis Montagu.

211 *septangularis* (Montagu 1803). FH3, 458. J4, 390.

LORA Gistel 1848. *Tritonium viridulum* Fabricius.

212 *turricula* (Montagu 1803). FH3, 450. J4, 395.

212a *turricula turricula* (Montagu 1803). FH3, 450. J4, 395.

212b *turricula rosea* (Lovén 1846). J4, 396.

213 *trevelliana* (Turton 1834). FH3, 452. J4, 398 (*trevelyana*).

214 *rufa* (Montagu 1803). FH3, 454. J4, 392.

214a *rufa rufa* (Montagu 1803). FH3, 454. J4, 392.

214b *rufa ulidiana* (Thompson 1845). FH3, 457 and J4, 393
(*ulideana*).

TYPHLOMANGELIA Sars 1870. *Pleurotoma nivale* Lovén.

215 *nivalis* (Lovén 1846). J4, 388.

THESBIA Jeffreys 1867. *Tritonium nanum* Lovén.

216 *nana* (Lovén 1846). FH3, 461. J4, 359.

MANGELIA Risso 1826. *M. striolata* Risso.

217 *attenuata* (Montagu 1803). FH3, 488. J4, 377.

S.G. BELA Leach 1847. *Murex nebula* Montagu.

[*costulata* Risso 1826. Mediterranean.]

218 *costulata smithii* (Forbes 1840). FH3, 483 and J4, 376
(*striolata*).

219 *coarctata* (Forbes 1840). FH3, 485 and J4, 379 (*costata*).

219a *coarctata coarctata* (Forbes 1840). FH3, 486.

219b *coarctata metcalfei* (Thorpe 1844). FH3, 487.

[*rugulosa* (Philippi 1844). Mediterranean.]

220 *rugulosa derelicta* Reeve 1846. J4, 381.

221 *brachystoma* (Philippi 1844). FH3, 480. J4, 382.

222 *nebula* (Montagu 1803). FH3, 476. J4, 384.

223 *powisiana* (Dautzenberg 1889). FH3, 478 and J4, 386
(*laevigata*).

PHILBERTIA Monterosato 1884. *Pleurotoma bicolor* Risso.

S.G. COMARMONDIA Monterosato 1884. *Murex gracilis* Montagu.

224 *gracilis* (Montagu 1803). FH3, 473. J4, 363.

S.G. PHILBERTIA S.S.

[*leufroyi* (Michaud 1821).]

- 225 *leufroyi boothii* (Smith 1839). FH3, 468. J4, 366.
 226 *purpurea* (Montagu 1803). FH3, 465. J4, 373.
 227 *asperrima* (Brown 1827). FH3, 467. J4, 370 (*reticulata*).
 228 *linearis* (Montagu 1803). FH3, 470. J4, 368.

S.G. TERES Bucquoy Dautzenberg & Dollfus 1883. *Pleurotoma anceps* Eichwald.

- 229 *teres* (Reeve 1844). FH3, 462. J4, 362.

Sub-class *OPISTHOBRANCHIA*.

Order PLEUROCOELA.

ACTEONIDÆ.

ACTEON Montfort 1810. *Bulla tornatilis* Linné.

- 230 *tornatilis* (Linné 1758). FH3, 523 (*fasciata*). J4, 433.
 230a *tornatilis tornatilis* (Linné 1758). FH3, 523 (*fasciata*).
 J4, 433.
 230b *tornatilis tenellus* Lovén 1846. J4, 435.

DIAPHANIDÆ.

DIAPHANA Brown 1827. *D. candida* Brown.

- 231 *minuta* Brown 1827. FH3, 521 and J4, 427 (*hyalinus*).
 232 *expansa* (Jeffreys 1865). J4, 426. SI26, 10.
 233 *globosa* (Lovén 1846). J5, 223. SI26, 8.

ATYIDÆ.

HAMINOEA Turton 1830. *Bulla hydatis* Linné.

- 234 *navicula* (da Costa 1778). FH3, 530 and J4, 437. SI20, 18.
 235 *hydatis* (Linné 1758). FH3, 531. J4, 439 (*elegans*). SI20, 19.

AKERATIDÆ.

AKERA Müller 1776. *A. bullata* Müller.

- 236 *bullata* Müller 1776. FH3, 527. J4, 430.
 236a *bullata bullata* Müller 1776. FH3, 527. J4, 430.
 236b *bullata nana* Jeffreys 1867. J4, 431.
 236c *bullata farrani* Norman 1890.

RETUSIDÆ.

RETUSA Brown 1827. *R. obtusa* Brown.

- 237 *mammillata* (Philippi 1836). FH3, 514. J4, 420.
 238 *retusa* (Maton & Rackett 1807). FH3, 510 (*truncata*).
 J4, 421 (*truncatula*).
 239 *alba* (Kanmacher 1798). FH3, 512 and J4, 423 (*obtusa*).

S.G. CYLICHNINA Monterosato 1884. *Bulla umbilicata* Montagu.

- 240 *subcylindrica* (Brown 1827). FH3, 519 and J4, 413
 (*umbilicata*).
 241 *nitidula* (Lovén 1846). FH3, 515. J4, 412.
 RHIZORUS Montfort 1810. *R. adelaidis* Montfort.
 242 *acuminatus* Bruguière 1792. FH3, 500. J4, 411.

TRICLIDÆ.

CYLICHNA Lovén 1846. *Bulla cylindracea* Pennant.

243 *cylindracea* (Pennant 1777). FH3, 508. J4, 415.

ROXANIA Gray 1847. *Bulla cranchii* [Fleming].

[*utriculus* (Brocchi 1814). Italian Pliocene fossil].

244 *utriculus cranchii* (Fleming 1828). FH3, 533. J4, 440.

TRICLA Retzius 1788. *T. gioeni* Retzius.

[*lignaria* Linné 1758. Mediterranean].

245 *lignaria brownii* Leach 1852. FH3, 536. J4, 443.

246 *punctostriata* (Mighels & Adams 1841). J4, 446 (*librarius*).

PHILINIDÆ.

PHILINE Ascanius 1772. *P. quadripartita* Ascanius.

[*aperta* (Linné 1767). Cape of Good Hope].

247 *aperta quadripartita* Ascanius 1772. FH3, 539. J4, 457.

HERMANIA Monterosato 1884. *Bulla scabra* Müller.

248 *scabra* (Müller 1784). FH3, 543. J4, 447.

249 *catena* (Montagu 1803). FH3, 545. J4, 449.

OSSIANIA Monterosato 1884. *Philine scutulum* Lovén.

[*quadrata* (S. Wood 1839). Coralline Crag fossil.]

250 *quadrata scutulum* (Lovén 1846). FH3, 541. J4, 452.

251 *alata* (Forbes 1844). FH3, 547 and J4, 453 (*punctata*).

252 *angulata* (Jeffreys 1867). J4, 451. SI26, 11.

253 *nitida* (Jeffreys 1867). J4, 456. SI26, 12.

LAONA A. Adams 1865. *Bullaea pruinosa* Clark.

254 *pruinosa* (Clark 1827). FH3, 549. J4, 454.

COLPODASPIS M. Sars 1870. *C. pusilla* M. Sars.

Q. pusilla M. Sars 1870.

PELTIDÆ.

PELTA Quatrefages 1844. *P. coronata* Quatrefages.

255 *coronata* Quatrefages 1844. FH3, 612 and J5, 15 (*hancocki*).

TETHYIDÆ.

TETHYS Linné 1758. *T. leporina* Linné.

256 *punctata* (Cuvier 1804). FH3, 554 (*hybrida*). J5, 5.

Order PTEROPODA.

SPIRATELLIDÆ.

SPIRATELLA Blainville 1817. *Clio helicina* Phipps.

257 *retroversa* (Fleming 1823). FH2, 384 (*flemingii*). J5, 115.

258 *lesueurii* (Orbigny 1836).

CAVOLINIDÆ.

CLIO Linné 1767. *C. pyramidata* Linné.

259 *pyramidata* Linné 1767. J5, 119. SI26, 15.

260 *cuspidata* (Bosc 1802).

DIACRIA Gray 1847. *Hyalaea trispinosa* Lesueur.

261 *trispinosa* (Lesueur 1821).

CAVOLINA Abildgaard 1791. *C. natans* Abildgaard.

Q. inflexa (Lesueur 1813).

PERACLIIDÆ.

PERACLE Forbes 1844. *P. physoides* Forbes.

262 *triacantha* (Fischer 1882).

CYMBULIIDÆ.

CYMBULIA Péron & Lesueur 1810. *C. proboscidea* Oken.

Q. proboscidea Oken 1815.

PNEUMODERMOPSISIDÆ.

PNEUMODERMOPSIS Bronn 1862. *Pneumodermon ciliata*
Gegenbaur.

263 *ciliata* (Gegenbaur 1855).

264 *paucidens* (Boas 1886).

CLIONIDÆ.

CLIONE Pallas 1774. *C. borealis* Pallas.

[*limacina* (Phipps 1774). Arctic].

265 *limacina lebouri* Winckworth 1932. FH4, 292 (*borealis*).

CEPHALOBRACHIA Bonnevie 1914. *C. macrochaeta*
Bonnevie.

266 *bonneviei* Massy 1917.

Order ASCOGLOSSA.

STILIGERIDÆ.

HERMAEA Lovén 1844. *Doris bifida* Montagu.

267 *bifida* (Montagu 1815). FH3, 610. J5, 33.

268 *dendritica* (Alder & Hancock 1843). FH3, 609. J5, 34.

STILIGER Ehrenberg 1828. *S. ornatus* Ehrenberg.

269 *bellula* (Orbigny 1837).

ALDERIA Allman 1846. *Stiliger modestus* Lovén.

270 *modesta* (Lovén 1844). FH3, 611. J5, 33.

ELYSIIDÆ.

ELYSIA Risso 1818. *Notarchus timidus* Risso.

271 *viridis* (Montagu 1804). FH3, 614. J5, 31.

LIMAPONTIIDÆ.

ACTEONIA Quatrefages 1844. *A. senestra* Quatrefages.

272 *cocksii* (Alder & Hancock 1847). FH3, 616. J5, 30.

LIMAPONTIA Johnston 1836. *L. nigra* Johnston.

273 *capitata* (Müller 1774). FH3, 614 and J5, 28 (*nigra*).

274 *depressa* Alder & Hancock 1862. J5, 29.

Order ACOELA.

PLEUROBRANCHIDÆ.

BERTHELLA Blainville 1824. *Bulla plumula* Montagu.

275 *plumula* (Montagu 1803). FH3, 559. J5, 11.

Q plumula Vayssière 1898, non Montagu 1803.

PLEUROBRANCHUS Cuvier 1804. *P. peronii* Cuvier.

S.G. OSCANIUS Leach 1847. *Bulla membranacea* Montagu.

276 *membranaceus* (Montagu 1815). FH3, 558. J5, 10.

TRITONIIDÆ.

TRITONIA Cuvier 1797. *T. hombergii* Cuvier.

277 *hombergii* Cuvier 1803. FH3, 582. J5, 67.

S.G. CANDELLISTA Iredale & O'Donoghue 1923. *Tritonia alba*
Alder & Hancock.

278 *alba* Alder & Hancock 1854. J5, 68.

S.G. DUVAUCELIA Risso 1826. *D. gracilis* Risso.

279 *plebeia* Johnston 1828. FH3, 583. J5, 68.

280 *lineata* Alder & Hancock 1848. FH3, 583. J5, 68.

POLYCERIDÆ.

AEGIRES Lovén 1844. *Polycera punctilucens* Orbigny.

281 *punctilucens* (Orbigny 1837). FH3, 574. J5, 70.

EUPHURUS Rafinesque 1815. *Doris clavigera* Müller.

282 *claviger* (Müller 1776). FH3, 573. J5, 71.

CRIMORA Alder & Hancock 1862. *C. papillata* A. & H.

283 *papillata* Alder & Hancock 1862. J5, 74.

THECACERA Fleming 1828. *Doris pennigera* Montagu.

284 *pennigera* (Montagu 1815). FH3, 575. J5, 72.

285 *virescens* Forbes & Hanley 1851. FH3, 576. J5, 73.

286 *capitata* Alder & Hancock 1854. J5, 73.

PALIO Gray 1857. *P. ocellata* Alder & Hancock.

287 *dubia* M. Sars 1829. FH3, 577 and J5, 76 (*lessonii*).

288 *nothus* (Johnston 1838). FH3, 578 and J5, 76 (*ocellata*).

POLYCERA Cuvier 1816. *Doris quadrilineata* Müller.

289 *quadrilineata* (Müller 1776). FH3, 576. J5, 75.

ACANTHODORIS Gray 1850. *Doris pilosa* Abildgaard.

290 *pilosa* (Abildgaard 1789). FH3, 570. J5, 93.

291 *subquadrata* (Alder & Hancock 1845). FH3, 571. J5, 93
(*quadrangulata*).

ADALARIA Bergh 1878. *Doris proxima* Alder & Hancock.

292 *proxima* (Alder & Hancock 1854). J5, 88.

293 *loveni* (Alder & Hancock 1862). J5, 88.

ONCHIDORIS Blainville 1816. *O. leachii* Blainville.

294 *fusca* (Müller 1776). FH3, 567 and J5, 90 (*bilamellata*).

295 *muricata* (Müller 1776). FH3, 567 and J5, 87 (*aspera*).

296 *sparsa* (Alder & Hancock 1846). FH3, 570. J5, 92.

297 *depressa* (Alder & Hancock 1842). FH3, 568. J5, 91.

298 *inconspicua* (Alder & Hancock 1851). FH3, 569. J5, 91.

299 *oblonga* (Alder & Hancock 1845). FH3, 568. J5, 90.

S.G. ATALODORIS Iredale & O'Donoghue 1923. *Doris pusilla*
Alder & Hancock.

300 *pusilla* (Alder & Hancock 1845). FH3, 569. J5, 92.

301 *luteocincta* (M. Sars 1870).

GONIODORIS Forbes & Goodsir 1839. *Doris nodosa* Montagu.

302 *nodosa* (Montagu 1808). FH3, 572. J5, 81.

303 *castanea* Alder & Hancock 1845. FH3, 572. J5, 82.

OKENIA Menke 1830. *Idulia elegans* Leuckart.

304 *elegans* (Leuckart 1828). J5, 78.

305 *leachii* (Alder & Hancock 1854). J5, 79.

S.G. IDALIELLA Bergh 1881. *Idalia aspersa* (Alder & Hancock).

306 *aspersa* (Alder & Hancock 1845). FH3, 578. J5, 79.

307 *pulchella* (Alder & Hancock 1854). J5, 80.

ANCULA Lovén 1846. *Polycera cristata* Alder.

308 *cristata* (Alder 1841). FH3, 580. J5, 77.

ARGIDÆ.

CADLINA Bergh 1878. *Doris repanda* Alder & Hancock.

309 *laevis* (Linné 1767). FH3, 566 and J5, 86 (*repanda*).

ROSTANGA Bergh 1879. *Doris coccinea* Alder & Hancock.

310 *rufescens* Iredale & O'Donoghue 1923. FH3, 565 and J5, 86
(*coccinea*).

ALDISA Bergh 1878. *Doris zetlandica* Alder & Hancock.

311 *zetlandica* (Alder & Hancock 1854). J5, 84.

ARCHIDORIS Bergh 1878. *Doris tuberculata* A. & H.

312 *britannica* (Johnston 1838). FH3, 563 and J5, 83 (*tubercu-
lata*).

313 *flammea* (Alder & Hancock 1844). FH3, 564. J5, 83.

314 *stellifera* Vayssière 1904. J5, 85 (*testudinaria*).

DORIDIGITATA Orbigny 1839. *D. bertheloti* Orbigny.

315 *derelicta* (Fischer 1867).

GEITODORIS Bergh 1892. *Doris complanata* Verrill.

316 *planata* (Alder & Hancock 1846).

JORUNNA Bergh 1876. *Doris johnstoni* Alder & Hancock.

317 *tomentosa* (Cuvier 1804). FH3, 564 and J5, 85 (*johnstoni*).

APORODORIS Ihering 1886. *Doris millegrana* A. & H.

318 *millegrana* (Alder & Hancock 1854). J5, 84.

ARMINIDÆ.

ARMINA Rafinesque 1814. *A. tigrina* Rafinesque.

319 *loveni* (Bergh 1861). FH4, 290. J5, 17.

DENDRONOTIDÆ.

DENDRONOTUS Alder & Hancock 1845. *Doris arborescens*
Müller.

- 320 **frondosus** (Ascanius 1774). FH3, 586 and J5, 62
(*arborescens*).

SCYLLAEIDÆ.

SCYLLAEA Linné 1758. *S. pelagica* Linné.

- 321 **pelagica** Linné 1758. FH3, 584. J5, 66.

ZEPHYRINIDÆ.

ZEPHYRINA Quatrefages 1844. *Z. pilosa* Quatrefages.

- 322 **mucronifera** (Alder & Hancock 1844). FH3, 608. J5, 57.

JANOLUS Bergh 1884. *J. australis* Bergh.

- 323 **cristatus** (Chiaje 1841). FH3, 609 (*splendida*). J5, 58.

- 324 **hyalinus** (Alder & Hancock 1854). J5, 58.

- 325 **flagellatus** Eliot 1906.

LOMANOTIDÆ.

LOMANOTUS Verany 1844. *L. genei* Verany.

[*genei* Verany 1846. Mediterranean.]

- 326 **genei portlandicus** (Thompson 1860). J5, 65.

- 327 **marmoratus** (Alder & Hancock 1845). FH3, 585. J5, 64.

- 328 **flavidus** (Alder & Hancock 1846). FH3, 586. J5, 65.

HANCOCKIA Gosse 1877. *H. eudactylota* Gosse.

- 329 **eudactylota** Gosse 1877.

IDULIIDÆ.

IDULIA Leach 1852. *Doris maculata* Montagu.

- 330 **coronata** (Gmelin 1791). FH3, 587. J5, 61.

- 331 **fragilis** (Forbes 1838). FH3, 588. J5, 60.

- 332 **pinnatifida** (Montagu 1804). J5, 60.

- 333 **cuspidata** (Alder & Hancock, 1862). J5, 61.

- 334 **cinerea** (Trinchese 1881).

FLABELLINIDÆ.

CORYPHELLA Gray 1850. *Eolis rufibranchialis* Johnston.

[*verrucosa* (M. Sars 1829). Norway.]

- 335^a **verrucosa rufibranchialis** (Johnston 1832). FH3, 593. J5, 41.

- 335^b **verrucosa pellucida** (Alder & Hancock 1843). FH3, 596.
J5, 42.

- 336 **pedata** (Montagu 1815). FH3, 596 and J5, 43 (*landsburgi*).

- 337 **salmonacea** (Couthouy 1838).

- 338 **lineata** (Lovén 1846). FH3, 594. J5, 41.

EUBRANCHUS Forbes 1838. *E. tricolor* Forbes.

- 339 **tricolor** Forbes 1838.

- 339^a **tricolor tricolor** Forbes 1838. FH3, 604. J5, 54.

- 339^b **tricolor pallidus** (Alder & Hancock 1842). FH3, 603 and
J5, 54 (*picta*).

- 340 **exiguus** (Alder & Hancock 1848). FH3, 603. J5, 56.

- 341 **vittatus** (Alder & Hancock 1842). FH3, 601. J5, 53.

- 342 **cingulatus** (Alder & Hancock 1848) FH3, 600. J5, 53.
CUMANOTUS Odhner 1907. *C. laticeps* Odhner.
 343 **beaumonti** (Eliot 1906).

HEROIDÆ.

- HERO** Alder & Hancock 1855. *Cloëlia formosa* Lovén.
 344 **formosa** (Lovén 1844). J5, 63.

TERGIPEDIDÆ.

- EMBLETONIA** Alder & Hancock 1851. *Pterochilus pulcher*
 Alder & Hancock.

- 345 **minuta** (Forbes & Goodsir 1839). FH3, 607. J5, 36.
 346 **pulchra** (Alder & Hancock 1844). FH3, 607. J5, 36.
 347 **pallida** (Alder & Hancock 1854). J5, 36.

- TERGIPES** Cuvier 1805. *Limax tergipes* Forskal.

- 348 **despectus** (Johnston 1835). FH3, 605. J5, 56.

- CUTHONA** Alder & Hancock 1855. *Eolis nana* Alder &
 Hancock.

- 349 **nana** (Alder & Hancock 1842). FH3, 599. J5, 45.
 350 **peachii** (Alder & Hancock 1848). FH3, 591. J5, 45.
 351 **concinna** (Alder & Hancock 1843). FH3, 598. J5, 47.
 352 **amoena** (Alder & Hancock 1845). FH3, 602. J5, 50.
 353 **pustulata** (Alder & Hancock 1854). J5, 49.
 354 **couchii** (Cocks 1852). J5, 49.

- DIAPHOREOLIS** Iredale & O'Donoghue 1923. *Eolis*
northumbrica Alder & Hancock.

- 355 **northumbrica** (Alder & Hancock 1844). FH5, 602. J5, 50.

- CRATENA** Bergh 1864. *Doris caerulea* Montagu.

- 356 **caerulea** (Montagu 1804). FH3, 603. J5, 51.
 357 **aurantia** (Alder & Hancock 1842). FH3, 600 and J5, 48
(aurantiaca).

- 358 **foliata** (Forbes & Goodsir 1839). FH3, 599 and J5, 47
(olivacea).

- 359 **viridis** (Forbes 1840). FH3, 603. J5, 52.

- 360 **glotensis** (Alder & Hancock 1846). FH3, 601 and J5, 51
(glottensis).

- 361 **stipata** (Alder & Hancock 1843). FH3, 597. J5, 46.

FIONIDÆ.

- FIONA** Forbes & Hanley 1851. *Oithona nobilis* F. & H.

- 362 **pinnata** (Eschscholtz 1831). FH3, 589 and J5, 35 (*nobilis*).

CALMIDÆ.

- CALMA** Alder & Hancock 1855. *Eolis glaucoides* A. & H.

- 363 **glaucoides** (Alder & Hancock 1854). J5, 44.

AEOLIDIDÆ.

- FAVORINUS** Gray 1850. *Eolis alba* Alder & Hancock

364 **branchialis** (Ratke 1806). FH3, 597 and J5, 43 (*alba*).

365 **carneus** (Alder & Hancock 1854). J5, 44.

FACELINA Alder & Hancock 1855. *Eolida coronata* Forbes & Goodsir.

366 **drummondi** (Alder & Hancock 1848). FH3, 593. J5, 39.

367 **longicornis** (Montagu 1808). FH3, 592 and J5, 39 (*coronata*).

368 **punctata** (Alder & Hancock 1845). FH3, 594. J5, 40.

369 **elegans** (Alder & Hancock 1845). FH3, 595. J5, 40.

AEOLIDIA Cuvier 1797. *Doris papillosa* Linné.

370 **papillosa** (Linné 1758). FH3, 590. J5, 37.

EOLIDINA Quatrefages 1843. *E. paradoxa* Quatrefages.

371 **glauca** (Alder & Hancock 1845). FH3, 591. J5, 38.

372 **inornata** (Alder & Hancock 1845). FH3, 598. J5, 46.

Sub-class *PULMONATA*.

Order **BASOMMATOPHORA**.

ELLOBIIDÆ.

LEUCOPEPLA Peile 1926. *Voluta bidentata* Montagu.

373 **bidentata** (Montagu 1808). FH4, 191. J5, 104.

PHYTIA Gray 1821. *Voluta denticulata* Montagu.

374 **myosotis** (Draparnaud 1801).

374a **myosotis** *myosotis* (Draparnaud 1801). FH4, 196. J5, 106.

374b **myosotis** *denticulata* (Montagu 1803). FH4, 194. J5, 107 (*ringens*).

OTINIDÆ.

OTINA Gray 1847. *Helix otis* Turton.

375 **ovata** (Brown 1827). FH3, 321. J5, 110.

Order **STYLOMMATOPHORA**.

ONCHIDIIDÆ.

ONCHIDELLA Gray 1850. *Onchidium nigricans* Quoy & Gaimard.

376 **celtica** (Forbes & Hanley 1852). FH4, 3. J5, 95.

Class **SCAPHOPODA**.

DENTALIIDÆ.

DENTALIUM Linné 1758. *D. elephantinum* Linné.

1 **entalis** Linné 1758. FH2, 449. J3, 191.

1a **entalis** *entalis* Linné 1758. FH2, 449. J3, 191.

1b **entalis** *abyssorum* M. Sars 1859. J3, 197.

2 **vulgare** (da Costa 1778). FH2, 451 and J3, 195 (*tarentinum*).

SIPHONODENTALIUM M. Sars 1859. *Dentalium vitreum* M. Sars.

S.G. **PULSELLUM** Stoliczka 1868. *Siphonodentalium lofotense* M. Sars.

3 **lofotense** (M. Sars 1865). J5, 195.

4 **affine** (M. Sars 1865).

CADULUS Philippi 1844. *Dentalium ovulum* Philippi.

5 **jeffreysii** (Monterosato 1875). J5, 196 (*subfusiformis*).

Class LAMELLIBRANCHIA.

Sub-class *PRIONODESMACEA*.

Order PROTOBRANCHIA.

NUCULIDÆ.

NUCULA Lamarck 1799. *Arca nucleus* Linné.

1 **sulcata** Bronn 1831. FH2, 221 (*decussata*). J2, 141.

2 **nucleus** (Linné 1758). FH2, 225. J2, 143.

3 **hanleyi** Winckworth 1931. FH2, 220 and J2, 144 (*radiata*).

4 **turgida** Leckenby & Marshall 1875. FH2, 218 and J2, 149 (*nitida*).

5 **moorei** Winckworth 1931.

6 **tenuis** (Montagu 1808). FH2, 223. J2, 151.

NUCULANIDÆ.

NUCULANA Link 1807. *Arca rostrata* Gmelin.

7 **minuta** (Müller 1776). FH2, 226 (*caudata*). J2, 155.

YOLDIELLA Verrill & Bush 1897. *Yoldia lucida* Lovén.

8 **lucida** (Lovén 1846). J5, 173. SI25, 17.

[*lenticula* Möller 1842. Arctic.]

9 **lenticula tomlini** Winckworth 1932. FH2, 230 and J2, 154 (*pygmaea*).

PHASEOLUS Seguenza 1877. *P. ovatus* Seguenza.

10 **pusillus** (Jeffreys 1879).

Order FILIBRANCHIA.

ARCIDÆ.

LIMOPSIS Sassi 1827. *Arca aurita* Brocchi.

11 **aurita** (Brocchi 1814). J2, 161. SI25, 8.

GLYCYMERIS da Costa 1778. *G. orbicularis* da Costa.

12 **glycymeris** (Linné 1758). FH2, 245. J2, 166.

ARCA Linné 1758. *A. antiquata* Linné.

S.G. **NAVICULA** Blainville 1825. *A. noae* Linné.

[*tetragona* Poli 1795. Mediterranean.]

13 **tetragona britannica** Reeve 1844. FH2, 234. J2, 180.

S.G. **BARBATIA** Gray 1847. *A. barbata* Linné.

14 **lactea** Linné 1758. FH2, 238. J2, 177.

S.G. **BATHYARCA** Kobelt 1891. *A. pectunculoides* Scacchi.

15 **pectunculoides** Scacchi 1834. FH2, 241 (*raridentata*).
J2, 171.

ANOMIIDÆ.

ANOMIA Linné 1758. *A. ephippium* Linné.

16 ephippium Linné 1758. FH2, 325. J2, 30.

MONIA Gray 1849. *Anomia zelandica* Gray.

17 patelliformis (Linné 1761). FH2, 334. J2, 34.

18 squama (Gmelin 1791). FH2, 336 and J2, 35 (*striata*).

HETERANOMIA Winckworth 1922. *Anomia squamula* Linné.

19 squamula (Linné 1758). FH2, 332 and J2, 32 (*aculeata*).

MYTILIDÆ.

MYTILUS Linné 1758. *M. edulis* Linné.

20 edulis Linné 1758. FH2, 170. J2, 104.

21 galloprovincialis Lamarck 1819.

MODIOLUS Lamarck 1799. *Mytilus modiolus* Linné.

22 modiolus (Linné 1758). FH2, 182. J2, 111.

23 barbatus (Linné 1758). FH2, 190. J2, 114.

24 gallicus (Dautzenberg 1895).

[adriaticus Lamarck 1819. Mediterranean.]

25a adriaticus radiatus (Brown 1827). FH2, 187 (*tulipa*). J2, 116.

25b adriaticus ovalis (Sowerby 1859). J2, 117. SI7, 7.

26 phaseolinus (Philippi 1844). FH2, 186. J2, 118.

ADULA H. & A. Adams 1857. *Mytilus soleniformis* Orbigny.

27 simpsoni (Marshall 1900).

MUSCULUS Röding 1798. *Mytilus discors* Linné.

28 discors (Linné 1767). FH2, 195. J2, 126.

29 marmoratus (Forbes 1838). FH2, 198. J2, 122.

30 costulatus (Risso 1826). FH2, 205. J2, 125.

31 niger (Gray 1824). FH2, 202. J2, 128.

CRENELLA Brown 1827. *Mytilus decussatus* Montagu.

32 decussata (Montagu 1808). FH2, 210. J2, 133.

S pellucida (Jeffreys 1859). J2, 131.

S.G. RHOMBOIDELLA Monterosato 1884. *Modiola rhombea* Berkeley.

33 prideauxii (Leach 1815). FH2, 208 and J2, 131 (*rhombea*).

Order PSEUDOLAMELLIBRANCHIA.

PTERIIDÆ.

PTERIA Scopoli 1777. *Mytilus hirundo* Linné.

[hirundo (Linné 1758.) Mediterranean.]

34 hirundo anglica Brown 1827. FH2, 251 (*tarentina*). J2, 95.

OSTREIDÆ.

OSTREA Linné 1758. *O. edulis* Linné.

35 edulis Linné 1758. FH2, 307. J2, 38.

S.G. CRASSOSTREA Sacco 1897. *Ostrea virginica* Gmelin.

36 virginica Gmelin 1791.

37 angulata (Lamarck 1819).

PINNIDÆ.

PINNA Linné 1758. *P. rudis* Linné.

S.G. **ATRINA** Gray 1847. *Pinna nigra* Dillwyn.

38 *fragilis* Pennant 1777. FH2, 255 (*pectinata*). J2, 99 (*rudis*).

PECTINIDÆ.

PECTEN Müller 1776. *Ostrea maxima* Linné.

39 *maximus* (Linné 1758). FH2, 296. J2, 73.

CHLAMYS Röding 1798. *Pecten islandicus* Müller.

[*islandica* (Müller 1776). Iceland.] FH2, 303.

40 *islandica scotica* (Simpson 1910). J2, 58.

41 *nivea* (Macgillivray 1825). FH2, 276. J2, 54.

42 *varia* (Linné 1758). FH2, 273. J2, 53.

42a *varia varia* (Linné 1758). FH2, 273. J2, 53.

42b *varia purpurea* (Jeffreys 1863). J2, 53.

43 *distorta* (da Costa 1778). FH2, 278 and J2, 51 (*pusio*).

S.G. **AEQUIPECTEN** Fischer 1886. *Pecten opercularis* Linné.

44 *opercularis* (Linné 1758). FH2, 299. J2, 59.

S.G. **PSEUDAMUSSIUM** Mörch 1853. *Pecten septemradiatus* Müller.

45 *septemradiata* (Müller 1776). FH2, 288 (*danicus*). J2, 62.

46 *triradiata* (Müller 1776). FH2, 290 and J2, 63 (*dumasii*).

S.G. **PALLIOLUM** Monterosato 1884. *Pecten testae* Philippi.

47 *tigerina* (Müller 1776). FH2, 285 and J2, 65 (*tigrinus*).

47a *tigerina tigerina* (Müller 1776). FH2, 285. J2, 66 (*costata*).

47b *tigerina obsoleta* (Pennant 1777). FH2, 286 (var.). J2, 65 (*tigrinus*).

48 *striata* (Müller 1776). FH2, 281. J2, 69.

49 *furtiva* (Lovén 1846). J2, 67 (*testae*).

S.G. **SIMILIPECTEN** Winckworth 1932. *Pecten similis* Laskey.

50 *similis* (Laskey 1811). FH2, 293. J2, 71.

Q *vitrea* (Gmelin 1791). J5, 168. SI25, 5.

LIMIDÆ.

LIMA Cuvier 1797. *Ostrea lima* Linné.

S.G. **LIMARIA** Link 1807. *Ostrea inflata* Gmelin.

51 *hians* (Gmelin 1791). FH2, 268. J2, 87.

51a *hians hians* (Gmelin 1791). FH2, 268. J2, 87.

51b *hians glaciata* (Salis 1793). FH2, 270 (var.). J2, 88 (*tenera*).

52 *loscombi* Sowerby 1823. FH2, 265 and J2, 85 (*loscombi*).

S.G. **LIMATULA** S. Wood 1839. *Pecten subauriculata* Montagu.

53 *sulcata* Brown 1827. J2, 81 (*elliptica*). FH pl. 53 (*subauriculata*).

54 *subauriculata* (Montagu 1808). FH2, 263 (partly). J2, 82.

LIMEA Bronn 1831. *Ostrea strigilata* Brocchi.

55 *sarsii* Lovén 1846. J2, 78. SI25, 6.

Sub-class *TELEODESMACEA*.

ASTARTIDÆ.

ASTARTE J. Sowerby 1816. *Venus scotica* Maton & Rackett.56 **sulcata** (da Costa 1778). FH1, 452. J2, 311.57 **elliptica** (Brown 1827). FH1, 459. J2, 312.58 **montagui** (Dillwyn 1817). FH1, 464 and J2, 315
(*compressa*).S.G. **GOODALLIA** Turton 1822. *Macra triangularis* Montagu.59 **triangularis** (Montagu 1803). FH1, 467. J2, 318.

THYASIRIDÆ.

THYASIRA Lamarck 1818. *Tellina flexuosa* Montagu.60 **flexuosa** (Montagu 1803). FH2, 54. J2, 247.61 **croulinensis** (Jeffreys 1847). J2, 250.62 **ferruginea** Winckworth 1932. FH2, 60 and J2, 251
(*ferruginosa*).63 **subtrigona** (Jeffreys 1858). J2, 228 (*cycladia*).

LUCINIDÆ.

LORIPES Poli 1791. *Tellina lactea* Poli.[**lucinalis** (Lamarck 1818). Mediterranean.]64 **lucinalis leucoma** (Turton 1822). FH2, 57. J2, 233 (*lactea*).**MYRTEA** Turton 1822. *Venus spinifera* Montagu.65 **spinifera** (Montagu 1803). FH2, 49. J2, 240.**PHACOIDES** Gray 1847. *Venus jamaicensis* Lamarck.S.G. **LUCINOMA** Dall 1901. *Lucina filosa* Stimpson.66 **borealis** (Linné 1767). FH2, 46. J2, 242.**DIVARICELLA** Martens 1880. *Lucina angulifera* Martens.Q **divaricata** (Linné 1758). FH2, 52. J2, 235.

UNGULINIDÆ.

DIPLODONTA Bronn 1831. *D. lupinus* Bronn.67 **rotundata** (Montagu 1803). FH2, 66. J2, 254.68 **eddystonia** (Marshall 1895).

ERYCINIDÆ.

KELLIA Turton 1822. *Mya suborbicularis* Montagu.69 **suborbicularis** (Montagu 1803). FH2, 87. J2, 225.**LASAEA** Brown 1827. *Cardium rubrum* Montagu.70 **rubra** (Montagu 1803). FH2, 94. J2, 219.**TURTONIA** Alder 1848. *Venus minuta* Fabricius.71 **minuta** (Fabricius 1780). FH2, 81. J2, 260.

LEPTONIDÆ.

LEPTON Turton 1822. *Solen squamosus* Montagu.72 **squamosum** (Montagu 1803). FH2, 98. J2, 194.73 **nitidum** Turton 1822. FH2, 92. J2, 198.S.G. **NEOLEPTON** Monterosato 1875. *Lepton sulcatulum* Jeffreys.

74 *sulcatulum* Jeffreys 1859. J2, 201.

75 *sykesi* Chaster 1895.

Q obliquatum Chaster 1897.

S.G. EPILEPTON Dall 1899. *Lepton clarkiae* Clark.

76 *clarkiae* Clark 1852. FH4, 255. J2, 202.

GALEOMMATIDÆ.

GALEOMMA Turton 1825. *G. turtoni* Sowerby.

77 *turtoni* Sowerby 1825. FH2, 105. J2, 188.

MONTACUTIDÆ.

MONTACUTA Turton 1822. *Ligula substriata* Montagu.

78 *substriata* (Montagu 1803). FH2, 77. J2, 205.

79 *ferruginosa* (Montagu 1808). FH2, 72. J2, 210.

Q phascolionis Dautzenberg & Fischer 1925.

MYSELLA Angas 1877. *M. anomala* Angas.

80 *bidentata* (Montagu 1803). FH2, 75. J2, 208.

81 *tumidula* (Jeffreys 1866). J5, 177. SI25, 11.

82 *dawsoni* (Jeffreys 1863). J2, 216. SI25, 12.

ENTOVALVA Voeltzkow 1890. *E. mirabilis* Voeltzkow.

S.G. DEVONIA Winckworth 1930. *Synapticola perrieri* Malard.

83 *perrieri* (Malard 1904). J5, 178 (*donacina*). SI25, 10.

CYPRINIDÆ.

CYPRINA Lamarck 1818. *Venus islandica* Linné.

84 *islandica* (Linné 1767). FH1, 441. J2, 304.

ISOCARDIIDÆ.

GLOSSUS Poli 1795. *Chama cor* Linné.

85 *humanus* (Linné 1758.) FH1, 472. J2, 298.

CARDIIDÆ.

CARDIUM Linné 1758. *C. costatum* Linné.

S.G. ACANTHOCARDIA Gray 1851. *Cardium echinatum* Linné.

86 *aculeatum* Linné 1758. FH2, 4. J2, 268.

87 *echinatum* Linné 1758. FH2, 7. J2, 270.

88 *tuberculatum* Linné 1758. FH2, 11 (*rusticum*). J2, 273.

S.G. PARVICARDIUM Monterosato 1884. *Cardium parvum* Philippi.

[*minimum* Philippi 1836. Mediterranean.]

89 *minimum suediense* Reeve 1845. FH2, 33 (*suecicum*). J2, 292.

S papillosum Poli 1795. J2, 275. SI5, 5.

90 *ovale* Sowerby 1840. FH2, 25 and J2, 281 (*fasciatum*).

91 *scabrum* Philippi 1844. FH2, 22 and J2, 283 (*nodosum*).

92 *exiguum* Gmelin 1791. FH2, 29 (*pygmaeum*). J2, 278.

S.G. CERASTODERMA Poli 1795. *Cardium edule* Linné.

93 *edule* Linné 1758. FH2, 15. J2, 286.

93a *edule edule* Linné 1758. FH2, 15. J2, 286.

93b *edule lamarcki* Reeve 1845. FH2, 18 and J2, 287 (*rusticum*).

- 93^c **edule** *bellica* Reeve 1845. FH2, 21 (Ball's var.)
 S.G. LAEVICARDIUM Swainson 1840. *Cardium europeum* Swainson.
 94 **crassum** Gmelin 1791. FH2, 35 and J2, 294.

VENERIDÆ.

DOSINIA Scopoli 1777. *D. africana* Hanley.

- 95 **exoleta** (Linné 1758). FH2, 428. J2, 327.
 [lupinus (Linné 1758). Mediterranean.]
 96 **lupinus** *lincta* (Montagu 1803). FH2, 431. J2, 330.

GAFRARIUM Röding 1798. *Venus pectinata* Linné.

S.G. CIRCE Schumacher 1817. *Venus scripta* Linné.

- 97 **minimum** (Montagu 1803). FH1, 446. J2, 322.

CALLISTA Poli 1791. *Venus chione* Linné.

- 98 **chione** (Linné 1758). FH1, 396. J2, 332.

VENUS Linné 1758. *V. verrucosa* Linné.

- 99 **verrucosa** Linné 1758. FH1, 401. J2, 339.

- 100 **casina** Linné 1758. FH1, 405. J2, 337.

S.G. TIMOCLEA Brown 1827. *Venus ovata* Pennant.

- 101 **ovata** (Pennant 1777). FH1, 419. J2, 342.

S.G. CLAUSINELLA Gray 1851. *Venus fasciata* da Costa.

- 102 **fasciata** (da Costa 1778). FH1, 415. J2, 334.

S.G. CHAMELEA Mörch 1853. *Venus gallina* Linné.

- 103 **striatula** (da Costa 1778). FH1, 408. J2, 344 (*gallina*).

PAPHIA Röding 1798. *P. ala-papilionis* Röding.

S.G. VENERUPIS Lamarck 1818. *Venus perforans* Montagu.

- 104 **aurea** (Gmelin 1791). FH1, 392. J2, 349.

- 105 **rhomboides** (Pennant 1777). FH1, 388 and J2, 352
 (*virgineus*).

- 106 **pullastra** (Montagu 1803). FH1, 332. J2, 355.

- 107 **saxatilis** (Fleuriau 1802). FH1, 383 and J2, 357 (*perforans*).

S.G. RUDITAPES Chiamenti 1900. *Venus decussata* Linné.

- [**decussata** (Linné 1758). Mediterranean.]

- 108 **decussata** *fusca* (Gmelin 1791). FH1, 379. J2, 359.

IRUS Oken 1815. *Donax irus* Linné.

- 109 **irus** (Linné 1758). FH1, 156. J3, 86.

PETRICOLIDÆ.

PETRICOLA Lamarck 1801. *Venus lithophaga* Retzius.

S.G. PETRICOLARIA Stoliczka 1871. *Petricola pholadiformis* Lamarck.

- 110 **pholadiformis** Lamarck 1818.

MYSIA Lamarck 1818. *Venus undata* Pennant.

- 111 **undata** (Pennant 1777). FH1, 435. J2, 363.

DONACIDÆ.

DONAX Linné 1758. *D. rugosa* Linné.

- 112 **vittatus** (da Costa 1778). FH1, 332 (*anatinus*). J2, 402.

- 113 **variegatus** (Gmelin 1791). FH1, 336 and J2, 408 (*politus*).

MESODESMATIDÆ.

- ERVILIA** Turton 1822. *Mya nitens* Montagu.

- 114 **castanea** (Montagu 1803). FH1, 341. J2, 413.

TELLINIDÆ.

- TELLINA** Linné 1758. *T. radiata* Linné.

- 115 **squalida** Montagu 1803. FH1, 298 (*incarnata*). J2, 384.

- 116 **tenuis** da Costa 1778. FH1, 300. J2, 379.

- S.G. **FABULINA** Gray 1851. *Tellina fabula* Gmelin.

- 117 **fabula** Gmelin 1791. FH1, 302. J2, 382.

- S.G. **MOERELLA** Fischer 1887. *Tellina donacina* Linné.

- 118 **donacina** Linné 1758. FH1, 292. J2, 386.

- 119 **pygmaea** Lovén 1846. FH1, 295. J2, 388 (*pusilla*).

- S.G. **ARCOPAGIA** Brown 1827. *Tellina crassa* Pennant.

- 120 **crassa** Pennant 1778. FH1, 288. J2, 373.

- 121 **balaustina** Linné 1758. FH1, 290. J2, 371.

- GASTRANA** Schumacher 1817. *Tellina abildgaardiana* Spengler.

- 122 **fragilis** (Linné 1758). FH1, 284. J2, 367.

- MACOMA** Leach 1819. *M. tenera* Leach.

- 123 **balthica** (Linné 1758).

- 123a **balthica** *balthica* Linné 1758. FH1, 305. J2, 376 (*attenuata*).

- 123b **balthica** *rubra* (da Costa 1778). FH1, 304 (*solidula*). J2, 375.

SEMELIDÆ.

- SCROBICULARIA** Schumacher 1817. *S. arenaria* Schumacher.

- 124 **plana** (da Costa 1778). FH1, 326 and J2, 444.

- ABRA** Lamarck 1818. *Mactra tenuis* Montagu.

- 125 **tenuis** (Montagu 1803). FH1, 323. J2, 442.

- 126 **alba** (S. Wood 1802). FH1, 317. J2, 438.

- Q* **longicallus** (Scacchi 1834).

- 127 **nitida** (Müller 1776). FH1, 319 (*intermedia*). J2, 436.

- 128 **prismatica** (Montagu 1803). FH1, 321. J2, 435.

ASAPHIDÆ.

- GARI** Schumacher 1817. *G. vulgaris* Schumacher.

- 129 **fervensis** (Gmelin 1791). FH1, 274 and J2, 396 (*ferroensis*).

- S.G. **PSAMMOCOLA** Blainville 1824. *P. vespertinalis* Blainville.

- 130 **depressa** (Pennant 1777). FH1, 271 and J2, 398 (*vespertina*).

- S.G. **PSAMMOBELL**A Gray 1851. *Psammobia tellinella* Lamarck.

- 131 **tellinella** (Lamarck 1818.) FH1, 277. J2, 392.

- 132 **costulata** (Turton 1822). FH1, 279. J2, 394.

SOLENIDÆ.

- SOLECURTUS** Blainville 1824. *Solen strigilatus* Linné.

133 **scopula** (Turton 1822). FH1, 263 and J3, 3 (*candidus*).

S.G. ZOZIA Winckworth 1930. *Solen antiquatus* Donovan.

134 **chamasolen** (da Costa 1778). FH1, 259 (*coarctatus*). J3, 6 (*antiquatus*).

PHARUS Brown 1843. *Solen legumen* Linné.

[*legumen* (Linné 1758). Mediterranean.]

135 **legumen major** Bucquoy, Dautzenberg & Dollfus. FH1, 256. J3, 10.

CULTELLUS Schumacher 1817. *C. magnus* Schumacher.

S.G. PHAXAS Leach 1852. *Solen pellucidus* Pennant.

136 **pellucidus** (Pennant 1777). FH1, 252. J3, 14.

ENSIS Schumacher 1817. *E. magnus* Schumacher.

137 **ensis** (Linné 1758). FH1, 250. J3, 16.

138 **arcuatus** (Jeffreys 1865). J3, 19.

139 **siliqua** (Linné 1758). FH1, 246. J3, 18.

SOLEN Linné 1758. *S. vagina* Linné.

S.G. SOLENARIUS Dumeril 1806. *Solen vagina* Lamarck.

140 **marginatus** Montagu 1803. FH1, 242. J3, 20 (*vagina*).

MACTRIDÆ.

MACTRA Linné 1767. *Cardium stultorum* Linné.

[*corallina* (Linné 1758). Mediterranean.]

141 **corallina cinerea** Montagu 1803. FH1, 362 and J2, 422 (*stultorum*).

S. glauca Born 1780. FH1, 366 (*helvacea*). J2, 425.

SPISULA Gray 1837. *Cardium solidum* Linné.

142 **elliptica** (Brown 1827). FH1, 356. J2, 417.

143 **solida** (Linné 1758). FH1, 351. J2, 415.

144 **subtruncata** (da Costa 1778). FH1, 358. J2, 419.

LUTRARIIDÆ.

LUTRARIA Lamarck 1799. *Mya lutraria* Linné.

145 **lutraria** (Linné 1758). FH1, 370 and J2, 428 (*elliptica*).

146 **magna** (da Costa 1778). FH1, 374 and J2, 430 (*oblonga*).

MYIDÆ.

MYA Linné 1758. *M. truncata* Linné.

147 **truncata** Linné 1758. FH1, 163. J3, 66.

S.G. ARENOMYA Winckworth 1930. *Mya arenaria* Linné.

148 **arenaria** Linné 1758. FH1, 168. J3, 64.

SPHENIA Turton 1822. *S. binghami* Turton.

149 **binghami** Turton 1822. FH1, 190. J3, 70.

ERODONIDÆ.

ALOIDIS Megerle 1811. *A. guineensis* Megerle.

150 **gibba** (Olivi 1792). FH1, 180 (*nucleus*). J3, 56.

HIATELLIDÆ.

- HIATELLA** Bosc 1801. *H. monoperta* Bosc.
 151 *arctica* (Linné 1767). FH1, 141. J3, 82.
 152 *gallicana* (Lamarck 1818). FH1, 146 and J3, 81 (*rugosa*).
Q pholadis (Linné 1771).
PANOMYA Gray 1857. *Mya norvegica* Spengler.
 153 *arctica* (Lamarck 1818). FH1, 174 and J3, 78 (*norvegica*).
SAXICAVELLA Fischer 1878. *Mytilus plicatus* Montagu.
 154 *jeffreysi* Winckworth 1930. FH1, 149 (no name). J3, 75
 (*plicata*).

GASTROCHAENIDÆ.

- GASTROCHAENA** Spengler 1783. *G. cuneiformis* Spengler.
 155 *dubia* (Pennant 1777). FH1, 132 (*modiolina*). J3, 91.

PHOLADIDÆ.

- PHOLAS** Linné 1758. *P. dactylus* Linné.
 156 *dactylus* Linné 1758. FH1, 108. J3, 104.
BARNEA Risso 1826. *B. spinosa* Risso.
 157 *candida* (Linné 1758). FH1, 117. J3, 107.
 S.G. **ANCHOMASA** Leach 1852. *Pholas parva* Pennant.
 158 *parva* (Pennant 1777). FH1, 118. J3, 109.
ZIRFAEA Gray 1847. *Mya crispata* Linné.
 159 *crispata* (Linné 1758). FH1, 114. J3, 112.
PHOLADIDEA Turton 1819. *P. loscombiana* Turton.
 160 *loscombiana* Turton 1819. FH1, 123. J3, 116.
XYLOPHAGA Turton 1822. *X. dorsalis* Turton.
 161 *dorsalis* Turton 1822. FH1, 90. J3, 120.
 162 *praestans* Smith 1903.

TEREDINIDÆ.

- TEREDO** Linné 1758. *T. navalis* Linné.
 163 *norvegica* Spengler 1792. FH1, 66. J3, 168.
 164 *megotara* Forbes & Hanley 1848. FH1, 77. J3, 176.
 165 *subericola* Macgillivray 1845. J3, 177 (*mionota*).
 166 *malleolus* Turton 1822. FH1, 84. J3, 181.
 167 *pedicellata* Quatrefages 1849. J3, 174. SI25, 22.
 168 *navalis* Linné 1758. FH1, 74. J3, 171.
BANKIA Gray 1847. *Teredo bipalmulata* Lamarck.
Q fimbriatula Moll & Roch 1931. FH1, 86 (*palmulata*).
Q bipennata (Turton 1819). FH1, 80. J3, 182.

Sub-class *ANOMALODESMACEA*.Order *LATERNULACEA*.

PERIPLOMATIDÆ.

- COCHLODESMA** Couthony 1839. *Anatina leana* Conrad.
 169 *praetenue* (Montagu 1803). FH1, 235. J3, 34.

THRACIIDÆ.

THRACIA Blainville 1824. *T. corbuloidea* Blainville.

170 *phaseolina* (Lamarck 1818). FH1, 221. J3, 36 (*papyracea*).

171 *villosiuscula* (Macgillivray 1827). FH1, 224. J3, 37.

172 *pubescens* (Montagu 1803). FH1, 226. J3, 38.

173 *convexa* (W. Wood 1815). FH1, 229. J3, 39.

S.G. **IXARTIA** Leach 1852. *Mya distorta* Montagu.

174 *distorta* (Montagu 1803). FH1, 231. J3, 41.

LYONSIIDÆ.

LYONSIA Turton 1822. *Mya striata* Montagu.

175 *norwegica* (Gmelin 1791). FH1, 214 and J3, 29
(*norvegica*).

PANDORIDÆ.

PANDORA Lamarck 1799. *Tellina inaequivalvis* Linné.

176 *margaritacea* Lamarck 1799. FH1, 207 (*rostrata*). J3,
24 (*inaequivalvis*).

177 *pinna* (Montagu 1803). FH1, 210 and J3, 25 (*obtusa*).

Order SEPTIBRANCHIA.

POROMYIDÆ.

POROMYA Forbes 1844. *P. anatinoides* Forbes.

178 *granulata* (Nyst & Westendorp 1839). FH1, 204. J3, 45.

CUSPIDARIIDÆ.

CUSPIDARIA Nardo 1840. *C. typus* Nardo.

[*cuspidata* (Olivi 1792). Mediterranean.]

179 *cuspidata brevirostris* Brown 1829. FH1, 195. J3, 53.

Q rostrata (Spengler 1793). J3, 51. SI25, 21.

S.G. **CARDIOMYA** A. Adams 1864. *Neaera gouldiana* Hinds.

180 *costellata* (Deshayes 1833). FH1, 199. J3, 49.

S.G. **TROPIDOMYA** Dall & Smith 1886. *Neaera abbreviata* Forbes.

181 *abbreviata* (Forbes 1843). FH1, 201. J3, 48.

Class CEPHALOPODA.

Order DECEMBRACHIATA.

Sub-order TEUTHOIDEA.

ARCHITEUTHIDÆ.

ARCHITEUTHIS Steenstrup 1857. *A. dux* Steenstrup.

Q monachus Steenstrup 1857.

OMMASTREPHIDÆ.

OMMASTREPHESES Orbigny 1835. *Loligo bartramii* Lesueur.

1 *pteropus* Steenstrup 1857.

2 *caroli* Furtado 1887.

TODARODES Steenstrup 1880. *Loligo sagittatus* Lamarck.

3 *sagittatus* (Lamarck 1798). FH4, 233 and J5, 128
(*todarus*).

TODAROPSIS Girard 1890. *T. veranyi* Girard.

4 *eblanae* (Ball 1841). FH4, 235.

ILLEX Steenstrup 1880. *Loligo illecebrosus* Lesueur.

5 *coindetii* (Verany 1839). FH4, 231 and J5, 129 (*sagittatus*).

LOLIGINIDÆ.

ALLOTEUTHIS Wülker 1920. *Loligo media* Linné.

6 *media* (Linné 1758). FH4, 228 and 230 (*marmoræ*). J5, 132.

Q marmoræ (Verany 1839).

LOLIGO Lamarck 1798. *L. vulgaris* Lamarck.

7 *forbesii* Steenstrup 1856. FH4, 226 and J5, 130 (*vulgaris*).

8 *loligo* (Linné 1758). FH4, 227 (Mediterranean form).

Sub-order SEPIOIDEA.

SEPIIDÆ.

SEPIA Linné 1758. *S. officinalis* Linné.

9 *officinalis* Linné 1758.

9a *officinalis officinalis* Linné 1758. FH4, 238. J5, 138.

9b *officinalis filliouxii* Lafont 1868.

9c *officinalis fischeri* Lafont 1871.

S.G. PARASEPIA Naef 1923. *S. orbigniana* Férussac.

10 *orbigniana* Férussac 1826. J5, 140 (*elegans*).

S.G. RHOMBOSEPION Rochebrune 1880. *S. rupellaria* Orbigny.

11 *elegans* Orbigny 1826. FH4, 241 and J5, 141 (*bisserialis*).

SEPIOLIDÆ.

SEPIOLA Leach 1817. *S. rondeletii* Leach.

S.G. HETEROSEPIOLA Grimpe 1922. *Sepiola atlantica* Orbigny.

12 *atlantica* Orbigny 1839. FH4, 217. J5, 136 (*rondeleti*).

Q steenstrupiana Levy 1912.

S.G. SEPIOLA S.S.

Q affinis Naef 1912.

S.G. HEMISEPIOLA Grimpe 1922. *Sepiola pfefferi* Grimpe.

13 *pfefferi* Grimpe 1921. FH4, 220 (*rondeletii*, probably).

SEPIETTA Naef 1912. *Sepiola oweniana* Orbigny.

14 *oweniana* (Orbigny 1839).

Q neglecta Naef 1916.

ROSSIA Owen 1834. *R. palpebroso* Owen.

15 *macroso* (Oken 1836). FH4, 222 and 223 (*owenii*).

J5, 133.

S.G. ALLOROSSIA Grimpe 1922. *Rossia glaucopis* Lovén.

16 *glaucopis* Lovén 1845. J5, 134 (*papillifera*).

Order OCTOBRACHIATA.

OCTOPODIDÆ.

OCTOPUS Lamarck 1798. *O. vulgaris* Lamarck.

17 **vulgaris** Lamarck 1798. FH4, 209. J5, 144.

Q rugosus (Bosc 1792).

ELEDONE Leach 1817. *Octopus moschatus* Lamarck.

18 **cirrhusa** (Lamarck 1798). FH4, 211. J5, 146 (*cirrosa*).

BATHYPOLYPUS Grimpe 1921. *Octopus arcticus* Prosch.

19 **arcticus** (Prosch 1849).

SYSTEM.¹

In the Gastropoda I have closely followed the classification proposed by Thiele (1929, 1931). The arrangement of the Lamellibranchia is based on Pelseneer (1906, 1911); and I have endeavoured to harmonize his phylogeny (1911, p. 123) with Dall's classification (1895). For the systematics of the other classes see Thiele 1909, 1910 for Loricata, Pilsbry and Sharp 1897 for Scaphopoda, Grimpe 1922 for Cephalopoda.

NEW NAMES.

Clelandella. A sub-genus of *Cantharidus* in which the shell is broadly conical; the sculpture of the whorls consists of a series of granules along oblique lines of growth, lying regularly on cord-like spirals which are alternately large and small in the upper part of the whorl and form a projecting fillet at the peripheral keel and immediately above the suture. It resembles *Calliostoma* in general shape and in having a fillet, but its real affinities are with *Jujubinus* as is seen in the sculpture of the shell and in the radula. The type-species is *Trochus clelandi* Wood.

Similipecten. A sub-genus of *Chlamys* in which the valves are small thin discoidal and sculptured with fine concentric striations: very fine radial striae may be present, typically almost imperceptible, but in certain species "Camptonectes" sculpture is also present, and minute prickles are developed. The interior shows very fine radial striae. The hinge line is relatively long and the margins of the ears sloping outwards, so that the posterior ear is nearly continuous with the contour of the shell; the byssal notch is deep. The type species is *Pecten similis* Laskey.

Odostoma scotica is proposed for the form described by Jeffreys in "British Conchology" as *Odostomia conoidea*: Jeffreys gives a good figure on plate 73.

1. Fuller references are: Thiele, "Handbuch der systematischen Weichtierkunde," parts 1, 2, Jena, 1929 and 1931. Pelseneer, "A Treatise on Zoology, edited by E. Ray Lankester—Part 5, Mollusca," London 1906. Pelseneer, *Les Lamellibranches de l'Expedition du Siboga—Partie anatomique*, Leiden 1911. Dall, "A new classification of the Pelecypoda" *Trans. Wagner F. Inst. Sci.*, vol. 3, part 3, Philadelphia, 1895. Thiele, "Revision des Systems der Chitonen," *Zoologica*, vol. 56, Lief. 1, 2, Stuttgart 1909 and 1910. Pilsbry and Sharp, "Manual of Conchology," vol. 17, 1897. Grimpe, "Systematische Uebersicht der europäischen Cephalopoden," *Sitz. naturf. Ges. Leipzig*, 1922, p. 36.

In the additional references Dautzenberg and Fischer 1912 refers to *Résultats Camp. Sci. Monaco*, fasc. 37, "Mollusques provenant des Campagnes... dans les Mers du Nord," and Dautzenberg and Fischer 1925 refers to *Travaux Sta. Biol. Roscoff*, fasc. 3, "Les Mollusques marins du Finistère et de Roscoff."

Clione lebouri is proposed for the southern form of *C. limacina* (Phipps), described as differing from the northern form in size, radula and colour. See Lebour, J. Mar. Biol. Assoc., vol. 17, p. 785 (1931).

Yoldiella tomlini is proposed for the shell described by Jeffreys in "British Conchology" as *Leda pygmaea*. I defer to the opinion of Dautzenberg and Fischer 1912 in placing it as a sub-species of *lenticula* Möller, although extreme forms of *lenticula* from Greenland and *tomlini* from Scotland seem so distinct.

Thyasira ferruginea is proposed for the shell described by Forbes & Hanley as *Lucina ferruginosa* in "British Mollusca," vol. 2, p. 60. The original name *Kellia ferruginosa* Forbes 1844 is pre-occupied by Morris in 1843.

DECEMBRACHIATA is proposed as a substitute for the cephalopod order Decapoda, Leach 1817, to avoid confusion with the crustacean order Decapoda, which is in current use and dates from Latreille 1812. For symmetry, Octopoda is altered to OCTOBRACHIATA.

EMENDATIONS.

In accordance with article 19 of the International Code, emendations of names have been excluded, unless there is evidence (and not merely presumption) of error of transcription, lapsus calami or misprint at the time of the original publication. The emendations in this list are: *Cerithiopsis metaxae* for *C. metaxa*; *Oscanius* for *Osanius*; *Onchidoris* for *Onchidorus*; *Crenella prideauxii* for *C. prideaux*.

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Odhner, Bergens Museum Aarbok 1918-19 (1921).

42 *Littorina saxatilis*. Dautzenberg & Fischer 1912, p. 187.

47 *Hydrobia jenkinsi*. Smith, J. Conchol., vol. 6, p. 142 (1889).

66 *Alvania subsoluta*. Marshall, J. Malac., vol. 4, p. 67 (1895).

79 *Tornus imperspicuus*. Chaster, J. Malac., vol. 4, p. 56 (1895).

83 *Ammonicera tricarinata*. Webster, Ann. Mag. N.H., 2, vol. 18, p. 156 (1856).

116-123 *Balcis* spp. Sykes, Proc. Malac. Soc., vol. 5, p. 348.

Marshall, J. Conchol., vol. 10, p. 122 (1901) and vol. 15, p. 200 (1917). *sinuosa* Scacchi=*pernula* Monterosato.

Enteroxenos. Zool. Jahrb. Anat., vol. 15, p. 731 (1902).

Odostomia perezii. Dautzenberg & Fischer, 1925, p. 81.

151 *Odostomia oblongula*. Marshall, J. Malac., vol. 4, p. 38 (1895).

157-160Q *Turbonilla*. Marshall, J. Conchol., vol. 7, p. 382 (1894), vol. 9, p. 332 (1900) and vol. 15, p. 173 (1917).

169 *Crepidula fornicata*. Orton, Proc. Roy. Soc., B, vol. 81, p. 468 (1909).

172 *Carinaria* Sowerby, Thesaurus, vol. 3, pl. 279 (1866).

- 181 *Lamellaria*. Odhner, K. Sv. Vet. Akad. Hand., vol. 50, no. 5, p. 49 (1913).
- 186 *Cassidaria rugosa*. Kobelt, Iconographie, vol. 2, p. 71 (1900).
- 191 *Urosalpinx cinerea*. Orton, Essex Naturalist, vol. 22, p. 298 (1930). Federighi, J. Conchol., vol. 19, p. 171 (1931).
- 204 *Buccinum undatum*. Dautzenberg & Fischer, 1912, p. 101.
- 236 *Akera farrani*. Ann. Mag. N.H., 6, vol. 6, p. 68 (1890).
- Colpodaspis pusilla*. Garstang, Proc. Zool. Soc., 1894, p. 664.
- PTEROPODA. Vayssière, Res. Camp. Sci. Monaco, fasc. 47 (1915).
Massy, Sci. Proc. R. Dublin Soc., vol. 15, p. 223 (1917).
- NUDIBRANCHIA, i.e., Ascoglossa & Acoela. See also Ray Society Monographs by Alder & Hancock (1845-1855) and Eliot (1910): Iredale & O'Donoghue, Proc. Malac. Soc., vol. 15, p. 195 (1923).
- 5 *Nucula moorei*. Winckworth, Proc. Malac. Soc., vol. 19, p. 280 (1931).
- 10 *Phaseolus pusillus*. Jeffreys, Proc. Zool. Soc., 1879, p. 580.
- 19 *Heteranomia*. Winckworth, Proc. Malac. Soc., vol. 15, p. 32 (1922).
- 21 *Mytilus galloprovincialis*. Bucquoy, Dautzenberg & Dollfus, Moll. Roussillon, vol. 2, p. 133 (1890). An exotic introduction, not *galloprovincialis* of Jeffreys.
- 24 *Modiolus gallicus*. Feuille J. Nat., vol. 25, p. 97 (1895).
- 27 *Adula simpsoni*. Marshall, J. Malac., vol. 7, p. 167 (1900).
- 36 *Ostrea virginica*. Hanley, Recent Shells, p. 299 (1856). See also Churchill, Bur. Fish. Washington, Report for 1919, Appendix 8 (1921).
- 37 *Ostrea angulata*. Hanley, Recent Shells, p. 301 (1856).
- 68 *Diplodonta eddystonia*. J. Malac., vol. 4, pp. 35, 73 (1895).
- 75 *Lepton sykesi*. Marshall, J. Malac., vol. 4, p. 36 (1895).
Lepton obliquatum. Chaster, Irish Nat., vol. 6, p. 186 (1897).
- 138 *Ensis arcuatus*. Ford, J. Mar. Biol. Assoc., vol. 13, p. 558 (1925). Not the same as the curved shore form of *S. siliqua*.
Hiatella pholadis. Dautzenberg & Fischer, 1912, p. 509.
- 162 *Xylophaga praestans*. Smith, Proc. Malac. Soc., vol. 5, p. 328 (1903).
- CEPHALOPODA. See Pfeiffer, Nordisches Plankton, vol. 2, part 4 (1908). Also Grimpe, Zur Kenntnis der Cephalopoden der Nordsee (1925). Robson, Proc. Zool. Soc., 1925, p. 291.

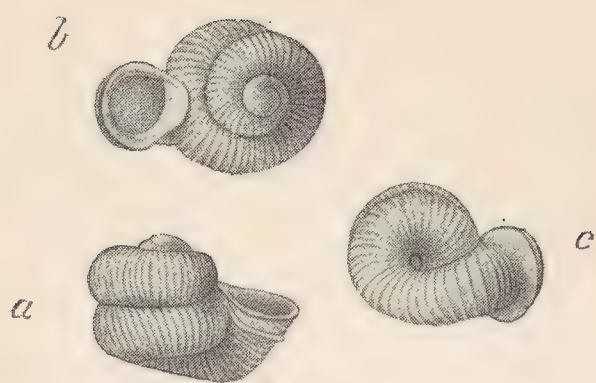


FIG.1.

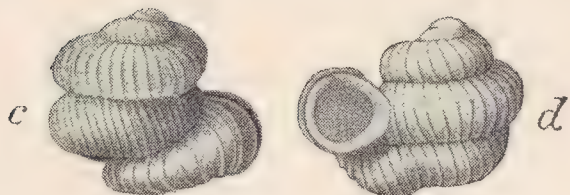


FIG.8.

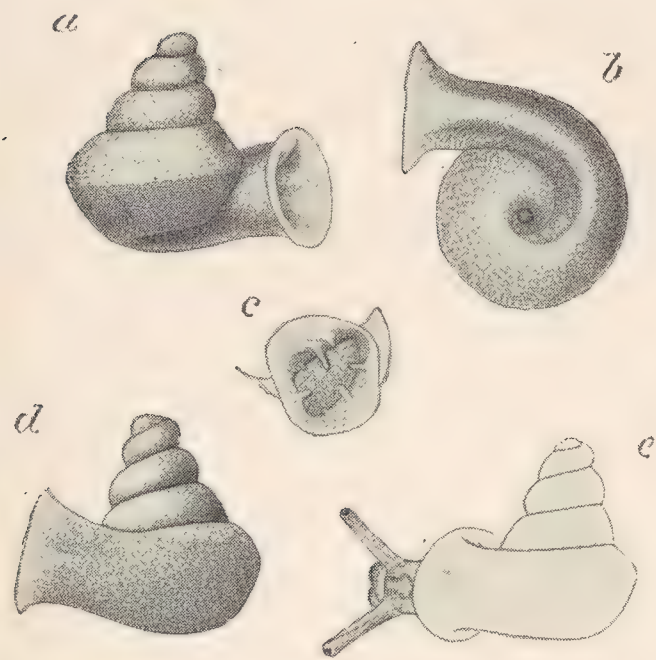


FIG.9.

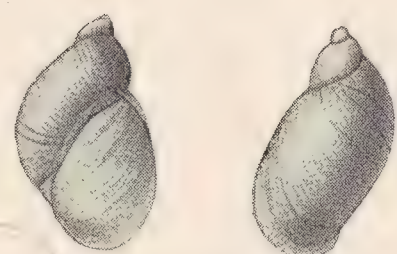


FIG.10.



FIG.11.

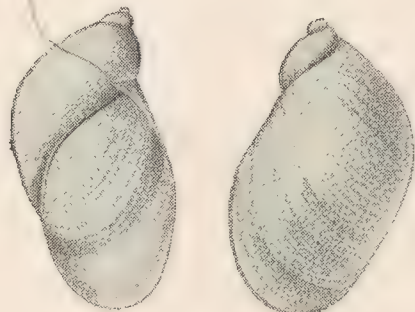


FIG.12.

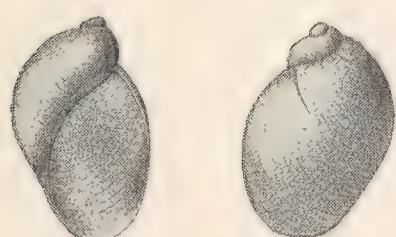


FIG.13.



FIG.2.

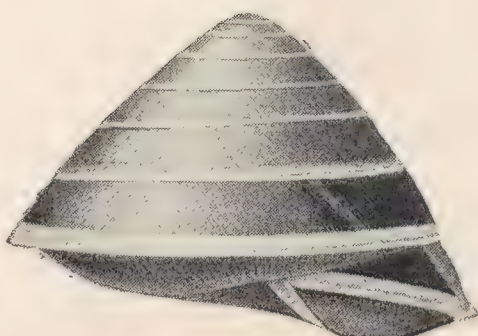


FIG.14.

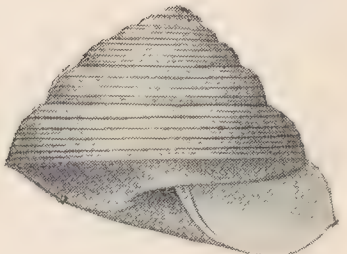


FIG.15.

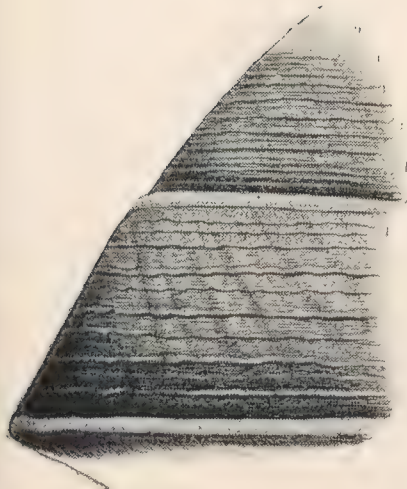


FIG 16



MALAY ARCHIPELAGO MOLLUSCA.

(see p. 210).

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John D. B. Marshfield

(see p. 253).

T H E
JOURNAL OF CONCHOLOGY.

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OCTOBER, 1932.

No. 8.

JOHN RICHARD BEECH MASEFIELD (1850-1932).

By CHAS. OLDHAM.

PLATE VIII.

(Read before the Society, April 9th 1932).

ON February 16th, 1932, died at his house, Rosehill, Cheadle, in his eighty-second year, J. R. B. Masefield, one of the best-known men in North Staffordshire. Born on March 11th, 1850, at Stone, where his father practised medicine for many years, he was educated at Cheltenham College and Jesus College, Cambridge, where he rowed in his college boat. He graduated as B.A. in 1872, and took his M.A. degree a few years later. He went to Cheadle in 1872, and for forty years, as a member of the firm of Blagg, Son and Masefield, practised as a solicitor. In June, 1881, he married Susan, second daughter of Charles John Blagg, the senior partner of his firm. She, with four children and seven grandchildren, survives him; their eldest son was killed in the war. When Masefield retired from active business about twenty years ago he had long been an outstanding figure among Staffordshire naturalists, and, freed from professional cares, he was then able to devote still more time to his favourite pursuits. Those who saw him on the occasion of his 80th birthday in 1930 were astonished at his vigour and alertness, mental and physical, and, although the last year of his life was clouded by bodily weakness, he was eager as ever in the many things that interested him. Natural History, however, did not monopolize his energies. Appointed a County Magistrate in 1917, he sat regularly on the Cheadle Bench. He was Vice-chairman of the Staffordshire County Pensions Committee, a member of the County Education Committee, and served in other public capacities. An active church worker, he was a prominent member of the Lichfield Diocesan Conference, a member of the National Church Assembly from its commencement and of several committees of the Diocesan Council. A Licensed Lay-Reader, he regularly read the Lessons at the Parish Church on Sunday mornings. The acquisition by the National Trust in 1927 of Hawksmoor, the beautiful nature reserve near Cheadle, was due entirely to his energy and enthusiasm in raising the purchase-money,

£1,200. An addition of 47 acres to the original area of 207 acres was also due to his zeal, and last year he had the satisfaction of handing over this extension to the Trust, free of encumbrance, a fitting finish to his many public services.

As a naturalist, Masefield was no narrow specialist, one who knows something of his own subject and nothing of any other, engaged in the intensive cultivation of a small corner of a big garden, but, what it is the fashion to belittle nowadays, a whole-hearted lover of the open air and the creatures that live in it. His interest in the mollusca was indeed little more than an incident in his wider interest in animated nature. He devoted much time to the study of vertebrates, lepidoptera, aculeate hymenoptera and plants, and in the course of his long life had acquired an unrivalled knowledge of the fauna and flora of his native county. Essentially an outdoor man, the knowledge he was so ready to impart to others had been mostly acquired at first hand. He used to say that the best way to see the country is to go about on one's two feet—an admirable practice, becoming ever rarer in these days of mechanical traction. His zest and industry were matched by his genial courtesy and his readiness to help others less informed than he. In the spring of 1890, a young man who had some liking for snails was living in rooms in Stoke-on-Trent. Him Masefield befriended and generously devoted several Saturday afternoons to showing him the habitats of such species as *Acanthinula lamellata* and *Sphærium pallidum* and to talk about bats and birds and other things in which the two had a common interest. It happened that nearly twenty years afterwards the young man was able to make some return, by showing his sometime mentor how and where *Limax tenellus* lives in the Chiltern beech-woods. The slug was new to Masefield, but—and this is the point of my story—within a week of his return to Cheadle he found it among the old beeches at Dimminsdale.

Elected a member of the Conchological Society in 1887, Masefield was President for the year 1897-8; the subject of his Presidential address being "The Economic Use of some British Mollusca." Vols. ix, x, xiii and xiv of the *Journal* contain notes by him, chiefly concerned with Staffordshire snails. To the *Annual Reports and Transactions*¹ of the North Staffordshire Field Club he contributed many notes, either under specific titles or in his yearly reports to the Zoological Section. Among these were *The Land and Fresh-water Shells of North Staffordshire*, vol. xx (1886); *The Land and Fresh-water Mollusca of North Staffordshire*, vol. xxiii (1889); and *The Land and Fresh-water Mollusca of Staffordshire*, vol. xxxvi (1902).

¹ From 1916 onwards *Transactions and Annual Report*.

He was, with B. B. Woodward, responsible for the article on Mollusca in the *Victoria History of the County of Stafford* (1908), to which work he also contributed the article on Birds and in part, that on Lepidoptera. His collection of British Land and Fresh-water shells—a fairly complete one—was acquired by the Stoke-on-Trent Museum (Hanley) in 1931.

The publications of the North Staffordshire Field Club give some idea of Masefield's researches in local Natural History. He joined the Club in 1883, and was its Nestor when he died forty-nine years afterwards. In the interim he contributed numerous papers on different subjects to the *Transactions*. For forty-seven years he submitted an Annual Report to the Club's Zoological Section, and for thirty-six years he was Hon. Treasurer. He was four times President, i.e. in 1889-90, 1903-4, 1914-5 (Jubilee year) and 1923-4. In 1901 he was awarded the Club's Garner Medal "for his contributions to the Natural History of the County, and for his papers on the fauna of North Staffordshire"; and in 1925 its Spanton Medal—the first award—"for more than forty years' consistent work in the field of local Zoology."

When, some twenty-three years ago, the scheme was inaugurated for "ringing" birds, which has thrown so much light on the movements of migrants, Masefield took the matter up with characteristic enthusiasm. He marked many hundreds of nestling birds, and so contributed materially to our knowledge of the subject; a swallow ringed in the porch of his house at Cheadle was subsequently recovered in South Africa. The protection of wild birds—as indeed of fauna generally—found in him a militant supporter and advocate. His *Wild Bird Protection and Nesting Boxes* was published so long ago as 1897. A well-known figure at the Annual Meetings of the Royal Society for the Protection of Birds, he served on its General Council and was a member of its Watchers' Committee. His lectures for the Society in different parts of the country did much to popularize the cause for which it stands. His zeal for protection was not, however, due primarily to humanitarian or sentimental motives, but rather to a desire to conserve rare and beautiful forms of life, and he found nothing incompatible in this desire and the shooting of pheasants and other game; he was indeed a keen sportsman and an excellent shot.

NOTE ON THE TRUE GENUS OF DORIS (?) KALKENSIS Barnard.

By K. H. BARNARD, D.Sc., F.L.S.

(Read before the Society, February 3rd, 1932).

IN an account of the South African Nudibranchs (Ann. S. Afr. Mus. vol. 25, 1927) a coloured figure of this species was published (pl. 19, fig. 9), and it was explained (p. 189) that no anatomical description could be given as the specimen had been accidentally destroyed during preservation. The species was based on a pictotype.

In spite of certain criticisms regarding the value of publishing coloured figures of Nudibranchs without anatomical descriptions, I am of the same opinion as Sir Charles Eliot who defended (Proc. Zool. Soc. 1906, ii, p. 637) the publication of Kelaart's drawings. The stimulus to local naturalists is much greater if there is the prospect of identifying their captures, even though a particular species may not have been definitely placed in its true systematic position. This has recently been confirmed by the finding of a second specimen of *D. kalkensis*, its recognition from the coloured drawing, and its presentation to the South African Museum for correct determination.

On August 22nd, 1931, Dr. A. Zoond of the Zoology Department, University of Cape Town, found a very fine specimen of this species at St. James, False Bay, the locality where the original specimen was found. Evidently it is a rare species, or at least rare in the littoral zone. Dr. Zoond found this specimen on reddish-coloured rock at low-tide, the general colour of the back very closely simulating that of the surrounding rock. The animal was kept a week in the laboratory, and then handed over to me while still alive. The colouration agreed with that of the original specimen except that the middle of the back was a rather darker shade of red, and the blue spots around the brim were larger and more or less confluent into patches. The rhinophores were dark red-brown at the base, the clubs blue-black with white tips. The gills were pale salmon with blue-grey speckles. Anal orifice orange, foot salmon. When fully expanded the animal measured about 100 mm. in length, and 40-50 mm. in width.

The brim was very flexible and sensitive. Dr. Zoond found that when the back was gently stroked, the whole brim curled upwards and inwards, the edges almost meeting in the middle line, as if to ward off the offender.

Dissection at once showed that this species is a true *Dendrodoris* (olim *Doriopsis*).

Back smooth, brim wide and undulating, tail of the foot projecting beyond the brim. Spicules not present. No tentacles visible. Gills 5, multi-pinnate. Liver deeply (10 mm.) incised posteriorly. Gonads unripe.

As Bergh (1907) has described four species of *Dendrodoris* from South African waters, it is necessary to see if *kalkensis* can be identified with any of these, especially as three of them came from False Bay. Colour, character of the skin, and the number of gills are the only useful characters. As Eliot says (l.c. p. 661) the internal anatomy is not helpful in the majority of cases. All Bergh's specimens were very much smaller than either of the two specimens of *kalkensis*.


D. callosa is at once excluded as it had spicules in the skin. *D. cæsia* had 8 gills, and D.sp. had 6 gills. The single specimen of the latter showed scarcely any fissure at the end of the liver. The former was "bluish" but, besides the more numerous gills, was only 14 mm. long while containing ripe gonads. It seems, therefore, that *kalkensis* cannot be referred to any of the False Bay species; the most likely is "D.sp." with 6 gills, and as the species was not named no question of synonymy arises.

The Natal species *D. capensis* had 5 gills and the colour as preserved showed black patches round the brim. The present specimen after being preserved a week in alcohol shows no approximation to the colour of *capensis*; all the blue patches have faded, leaving the margin of the brim whitish. It is, however, possible that *kalkensis* is synonymous with *capensis*. Nevertheless the doubt will remain until living specimens are collected in approximately the same locality off the Natal coast.

The likeness to Kelaart's *Doris elizabethina* (Eliot. l.c. p. 666, pl. 43, fig. 3) is even more striking in the present specimen than in the original one. Kelaart's figure, however, shows 6 bipinnate gills.

The gills in *kalkensis* are extraordinarily ramose and it is impossible to count their number decisively in the living animal; Dr. Zoond thought there were 5, I thought there were 6. On preservation 5 proved to be the correct number.

In conclusion, therefore, I maintain *kalkensis* as a valid species of *Dendrodoris*.



FURTHER LOCALITIES FOR *PLANORBIS VORTICULUS* Troschel.

By A. E. ELLIS.

(Read before the Society, September 5th, 1931).

As a result of extensive investigation of the marshes of the Arun valley from Arundel to Pulborough, the known range of *Planorbis vorticulus* Troschel in West Sussex has been extended southwards to North Stoke and northwards to Pulborough. The former locality is a mile and a half from Amberley, where the species was found in 1927,¹ and the ditches near the Marehill cricket ground, Pulborough, where it was observed in July, 1931, are three miles to the north of the Wild Brooks. *P. vorticulus* has not been found west of the river Arun, and *Valvata macrostoma* (Steenbuch MS.) Mörch, for which search was also made, has yet to be detected in West Sussex.

The vegetation of the drains at North Stoke, just north of the village, in which *P. vorticulus* was fairly plentiful, was principally composed of various duckweeds (*Lemna trisulca*, *L. minor*, *L. polyrrhiza* and *Wolffia arrhiza*), together with *Elodea canadensis*, *Potamogeton natans*, *Hydrocharis morsus-ranæ*, *Ceratophyllum demersum*, *Typha latifolia* and *Equisetum limosum*. *P. vorticulus* was generally distributed in the ditches between North Stoke and the river Arun, being commonest amongst *Lemna trisulca*, but was not to be found in similar dykes south of the village. It would seem to be essentially a surface dweller, living chiefly amongst Lemnaceæ, and might almost be regarded as a plankton mollusc. The associated species of mollusca found in this locality were *Hydrobia jenkinsi* Smith, *Bithynia tentaculata* (L.), *Valvata piscinalis* (Müll.), *V. cristata* Müll., *Lymnæa palustris* (Müll.), *L. stagnalis* (L.), *L. pereger* (Müll.), *Planorbis corneus* (L.), *P. planorbis* (L.), *P. carinatus* Müll. and *P. complanatus* (L.) [=fontanus Lightfoot]. In one of the ditches, separate but only five yards away from those where these mollusca occurred, nothing but *Lymnæa palustris* and *Planorbis spirorbis* (L.) was taken, affording a striking instance of that extreme localization of freshwater snails which is so often encountered. This drain was overshadowed by elms, and lacked all the characteristic plants of the others, being almost choked with the grass *Glyceria aquatica*. Water mites and swarms of Entomostraca, principally Ostracods and Daphnids, compensated for the paucity of mollusca.

A fairly thorough exploration of the "brooks" south of this place as far as Arundel failed to reveal any further locality for

¹ Proc. Malac. Soc., xviii, p. 127.

P. vorticulus, although there would seem to be nothing to preclude its inhabiting many apparently suitable drains in this district. Between Pepperering and South Stoke, for example, is a dyke in which *Wolffia arrhiza* and *Lemna polyrrhiza* grow in great profusion, together with *Lemna minor* and *L. gibba*, affording what looks like an ideal habitat, but although all the species of snails which were found in association with this mollusc at North Stoke were represented in this or in communicating drains, *P. vorticulus* itself was not to be seen.

The chief plants in the ditches near Pulborough where *P. vorticulus* occurred were *Lemna minor*, *L. gibba*, *L. polyrrhiza*, *Elodea canadensis*, *Sagittaria sagittifolia*, *Equisetum limosum*, *Sparganium* sp. (not in flower), *Nasturtium amphibium*, *Phalaris arundinacea*, *Glyceria fluitans* and *Myosotis palustris*. *P. vorticulus* was found amongst duckweed principally, but in neighbouring ditches where *Lemna gibba* covered the water in dense masses to the exclusion of other species, this mollusc was absent. The associated species in the Pulborough drains were *Bithynia tentaculata*, *Valvata piscinalis*, *V. cristata*, *Lymnæa palustris*, *L. stagnalis*, *L. pereger*, *Physa fontinalis* (L.), *Planorbis corneus*, *P. planorbis*, *Pisidium nitidum* Jenyns and *P. subtruncatum* Malm. For the identification of the last two species I am indebted to Mr. Charles Oldham.



Pearls in *Mytilus edulis* L.—The common mussel is abundant on the shores of N.E. Kent, and after very rough weather quantities are thrown up at certain points. The blizzard of Feb. 10th, 1932 dislodged many from below ordinary low-water mark. Attached to some of these were *Corallina officinalis* and *Laminaria*, others bore living *Crepidula fornicata*. A few of the older shells on the shore at Swalecliff were found to contain pearls and some others had pearl blisters. One shell measuring only 51 × 24 mm. contained the surprising number of 93 pearls. Most of them were very small, the largest was fully 3 mm. in diameter. It is, of course, nothing new to find pearls in the common mussel, but to get 93 from a single shell seems worth recording.—J. E. COOPER (*Read before the Society*, April 9th, 1932).

New Name for *Sarama* G.-A.—In the *Fauna of British India, Testacellidæ and Zonitidæ*, p. 275, 1908, Godwin-Austen described a new Zonitid genus under the name of *Sarama* with genotype *Macrochlamys kala* G.-A. This name is pre-occupied, having been used by Moore in 1888, *Lepid. Atk.*, p. 203, for a Pyralid group, and I propose, therefore, to substitute *Rasama* for *Sarama* Godwin-Austen.—F. F. LAIDLAW.

ANATOMICAL NOTES ON MARGARITIFERA Schumacher.

By H. H. BLOOMER, F.L.S.

(Read before the Society, December 2nd, 1931).

By the kindness and interest of conchologists¹ I have been able to obtain the animals of *M. margaritifera* from several localities additional to those mentioned in a previous paper on *M. durrovensis* Phillips,² and in the following notes it will be an advantage to include all of them. However, it cannot be expected to find any essential anatomical difference when it is remembered that, after the description of the animal of *M. auricularia* by Haas,³ Ortmann⁴ in his examination and comparison of that species with the one of *M. margaritifera* could find so little. Haas⁵ subsequently described another feature and that is the connection, for some distance, of the anterior edge of the inner gill with the mantle, close to the line of the mantle-attachment to the side of the visceral mass, which is present in both species, and which also is to be seen, in a more or less degree, in all the specimens herein mentioned.⁶

The branchial and anal apertures offer little for comment and are relatively the same in all, except that in the Wye (var. *siluriana*), Glengarrif and county Clare specimens they take a more ventral direction, corresponding to the slope of the dorso-posterior part of the shell, and consequently give the horizontal ridge on the inner surface of each mantle lobe a slightly downward trend.

The borders of the branchial and anal apertures, the papillæ, the horizontal ridges, the transverse furrow of the foot and the part ventral to it are of a light brown to a blackish-brown colour—the foot being much lighter than the other parts; the Esk, Glengarrif and Shetland ones are darker than the Nore (*M. durrovensis* Phillips), Wye and county Clare ones.

The papillæ bordering the branchial aperture appear to vary in size and shape, but much depends upon their contracted or

1. I wish to express my thanks to Mr. Charles Oldham for specimens from the Burn of Setter, Walls, Shetland; to Professor A. E. Boycott and Mr. Charles Oldham for specimens from a tributary of the river Glengarrif, Ireland; to Mr. Abernethy for specimens from county Clare, Ireland, and to Mr. Thos. Rhea for specimens from the river Esk, Yorkshire.

2. *Margaritifera durrovensis*, anatomical notes, Proc. Malac. Soc., vol. xviii, pt. 2, August, 1928.

3. F. Haas, Pseudunio, neues Genus für Unio sinuatus, Lam. Nachrbl. Deutsch. Malak. Gesell. iv, 1910.

4. A. E. Ortmann. Studies in Najades, Nautilus, vol. xxvii, no. 8, Dec. 1913.

5. F. Haas, Anatomische Untersuchungen an europäischen Najaden. Archiv. für Mollusk. lvi, 1924.

6. Ortmann had noticed (in 1911) in the North American Margaritana the attachment of the anterior edge of the inner gill but does not state in detail the manner in which it is attached. "The anatomical structure of certain exotic Naiades compared with that of the North American forms." Nautilus, vol. xxiv, no. 9, 1911, p. 104.

expanded condition. The Esk ones are large, do not taper and are lobed at the free end, the county Clare ones are similar but smaller, the Wye ones taper a little, so do the Nore ones but they are larger, whilst some of the Glengarrif ones taper more and at the free end have a digitate appearance, and the Shetland ones taper still more and are more expanded at the free end.

The foot is large and muscular in the Esk and Shetland specimens, smaller in the county Clare ones and there is little difference in the others. The transverse furrow of the foot is deeper and broader in the Esk, Shetland and Glengarrif ones, and is not so plainly shown in the county Clare and Wye ones. Then too, the reticulated groovings of the foot ventral to the furrow are more distinct in the Esk, Shetland and Glengarrif ones and finer in the county Clare and Wye ones. These characters in a large measure are subject to the degree of contraction of the foot; this is particularly evident in one Esk specimen where the foot is expanded and the groovings are considerably diminished.

The muscle surfaces seen after the removal of one valve of the shell show the anterior adductor to be reniform in shape, but the Shetland one is more curved and in this respect resembles the Wye one, the county Clare one is a little broader and the Esk one is larger; the shape of the posterior adductor is somewhat ovate-oblong; the Shetland one is wider in the anterior part and the Esk one is altogether broader; the anterior retractor is smaller in the Glengarrif and county Clare ones and larger in the Esk one; the posterior retractor is small in the county Clare one, larger in the Shetland one and larger still in the Esk one; the protractor seems to be a more variable muscle, crescent shaped in the Glengarrif, Wye and county Clare ones, nearly triangular in the Shetland one, and large and irregular in the Esk one where it takes a more antero-posterior direction; the elevator is broad in the Esk one.

The labial palps are more difficult to compare owing to their imperfect condition, but it would seem they have the same general shape, subfalciform, though the Esk ones are larger and broader, the county Clare ones smaller and the Shetland ones are not so pointed.

From the foregoing it will be observed that certain differences do occur though many of them are of a less important nature, such as the colour of the branchial and anal apertures, the size and shape of the branchial papillæ, the shape of the muscles and the extent of the transverse furrow and groovings of the foot, all of which have a tendency to vary, even in animals from the same

locality. Further, some of the differences may be intensified when the animal is in a contracted state, or may not be nearly so clear when it is in an expanded condition. On the other hand there are characters recognised as important in classification and probably indicating the course of development in the evolution of the Naiades, as for instance the shape and extent of the branchial and anal apertures, the connection of the gills with the sides of the visceral mass and the mantle, the shape and attachment of the labial palps, and the line of the mantle attachment, but these, as far as can be ascertained, do not present any material difference. There, however, still remains one other character of importance to consider and that is the shape and structure of the gills.

The inner and outer lamellæ of both gills (outer and inner gill-plates) are connected by interlamellar junctions, often irregularly distributed, but sometimes running more or less in an oblique direction, infrequently do they run parallel to the filaments, and seldom is there a tendency to form longer junctions.¹

Table I gives a comparison of the gills and it suggests that in the distribution of the interlamellar junctions the Shetland, county Clare and Glengarrif gills show a more primitive state than those of the Esk, and that the Nore and Wye ones are a little more advanced than the Esk ones.

1. A. E. Ortmann. Studies in Najades, Nautilus, Dec. 1913. States that the gill structure of *M. sinuata* [*auricularia*] from the Eastern Pyrenees, "is entirely like that of *M. margaritifera*, that is to say, the interlamellar connections are irregularly scattered and do not form septa and water tubes and near the base of the gills there is a slight tendency to stand in oblique rows."

TABLE I. COMPARISON OF THE GILLS.

Locality.	Shape of Outer gill.	Shape of Inner gill.	Interlamellar junctions of Outer gill.	Interlamellar junctions of Inner gill.
Wye. (var. <i>siluriana</i>)	Broader in middle part.	Curved but broader in anterior part.	Anteriorly in short, irregular and oblique rows. Posteriorly more plentiful, irregular and not so oblique.	Anteriorly closer and more irregular rows. Posteriorly more plentiful, nearer the edge more vertical, where there is a tendency to form longer junctions.
Shetland.	Curved and narrow at anterior end.	Broader in anterior part.	Plentiful and fairly distributed, more or less in irregular oblique rows.	Plentiful in partly oblique rows. Posteriorly more numerous and not so oblique.
Glengarrif.	Curved and broader in posterior part.	Broader and rounded at antero-ventral margin.	Irregularly distributed; more plentiful posteriorly.	Irregularly distributed; more plentiful posteriorly.

COMPARISON OF THE GILLS. (*continued*)

Locality.	Shape of		Interlamellar junctions of	
	Outer gill.	Inner gill.	Outer gill.	Inner gill.
Esk.	Broader in posterior part ; narrowing much anteriorly.	Broader in middle part.	Fairly plentiful and more evenly distributed, tending to be more vertical nearer the edge of the gill.	Fairly distributed in somewhat oblique rows ; more plentiful posteriorly with tendency to be more vertical nearer the edge of the gill.
County Clare.	Curved and broader in middle part.	Broader in middle part.	Unevenly distributed ; more plentiful posteriorly.	Shorter but more vertical rows ; more plentiful posteriorly.
Nore. (<i>M. durrovensis</i>).	Curved and broader in middle part.	Broader in anterior part.	Fairly evenly distributed in irregular rows.	Fairly evenly distributed, generally in oblique rows but near the edge of the gill they are more vertical with a tendency to form longer junctions.

In the above comparison of the gills due regard must be given to the degree of contraction and whether the animals examined are male or female. In the latter case it is probable that the interlamellar junctions are more plentiful, closer and may have a tendency in some to form longer junctions.

Paludestrina jenkinsi above sea-level.—A short time ago, while dredging a small pond on the slopes of Cavehill, Belfast, near a place locally known as “Norah’s Grave,” I was surprised to find great numbers of *Paludestrina jenkinsi* among the material in the net. Its presence in this locality struck me as rather peculiar, since I have been in the habit of collecting specimens from the same pond for the past six or seven years, and although I have always examined the contents of the net with care I never before observed a single specimen. It is worth noting that the pond from which these specimens were obtained is just above the 500 ft. contour, which is a high altitude for the species. Mr. R. J. Welch has kindly confirmed my identification.—R. MACDONALD (*Read before the Society*, April 9th, 1932).

THE CLAUSIUM IN THE CLAUSILIIDÆ, WITH SPECIAL REFERENCE TO ALOPIA AND HERILLA.

By J. DAVY DEAN, F.E.S.,

Of the Department of Zoology, National Museum of Wales.

(Read before the Society, December 2nd, 1931).

EUROPEAN land mollusca may be characterised by the high development of the two families, Helicidæ and Clausiliidæ, the Helicoids attaining their maximum in the west, the Clausilias in the east. But not only are these families highly developed, they are highly specialised in many of the genera, which contain the most advanced species in organisation in the whole world.

Recent papers on the Clausiliidæ by Wagner, Soós, Cooke, Kennard and Woodward help considerably towards a more complete understanding of this difficult family. Dr. Soós, of Budapest, has contributed an excellent paper on *Alopiæ*, probably the most fascinating monograph on any of the European genera yet published.¹ What is the real meaning of the presence of seventy varieties and species crowded together in one small area on the Transylvanian Alps; isolated from each other, and from the rest of Europe? One of the fascinating points about the group is the fact that there are some species which do not possess a clausium; a second point is that several of the species are dextral; a third, brought out by Soós, that no fewer than sixteen of the species or varieties have a corresponding "mirror image"; a sinistral with a dextral species and vice versa, while the series from Bucsecs agree with each other also anatomically, although the situation of the respective organs is reversed.² The non-clausiate species, it should be mentioned, are considered to be archaic types which, in some cases, are nearing extinction. 'Authors agree in placing the group in close relationship with the extinct *Triptychia* (which lacks clausium) on the one side, and with *Eualopia* (Lower and Middle Miocene) and *Triloba* on the other.'³ It should also be noted that while the group is amphidromous the species are never so, as opposed to *Amphidromus* of the Malays and *Partula* of Polynesia. No two species of *Alopiæ* are ever found in association, not even with the "mirror image."

Soós classifies *Alopiæ* into two sections, sinistral and dextral, and then further separates the species with and without clausium. It will be at once seen that the species which are *absolutely* alike, except for the fact that the one is dextral and the other sinistral, become

1. The genus *Alopiæ*, L. Soós; Ann. Mus. Nat. Hungarici, vol. xxv, pp. 261-426, 1928

2. op. cit. p. 383.

3. The genus *Clausilia*, A. H. Cooke, Proc. Malac. Soc., vol. xi, p. 255, 1915.

widely separated in the text. In 1918 the writer of these notes proposed the name *Ithyption* as a section name for the non-clausiate species.¹ This was done on the advice of the late J. W. Taylor. Writing in this Journal in 1930 Dr. Cooke says 'this involves the assumption (which needs argument to support it) that the presence or absence of a clausilium is of more value in determining sectional distinction than the dextral or sinistral coil of the whorls.'² Considering how many times it becomes necessary to distinguish between 'clausiate' and 'non-clausiate' species in the text of Dr. Soós' classification, it would seem at least a convenience to classify these forms separately.

Superficially *Ithyption* may be distinguished from *Alopia* (to use the two terms in this sense for the sake of brevity) by the more *Balea*-like form of the shell. For some reason or other, a matter that may well be taken up by those who have access to the locality, there is not the need for a constricted aperture. Consequently the greatest width of the shell is, as with *Balea*, at the level of the penultimate whorl. In most forms of *Clausilia*, to use this name in its broadest sense, the greatest width is above the penultimate whorl. The armature in *Ithyption* is also quite different from *Alopia* (speaking in a general sense) but this divergence almost disappears in *Ithyption livida* var. *maxima* Sch. (= *deaniana* Cooke) where the columellar lamellæ are developed as if for the provision of a clausium, though none is present. Indeed, the abundance of *I. livida* and *I. glauca* auctt. (now to be known as *lactea* Bielz) which crowd together on the limestone scars, each variety confined to its own particular locality, seems to suggest that there is material in this group of shells, if the species could be studied ecologically, which would give an explanation for the use of one of the most extraordinary developments in shell-life, unique among all the genera of mollusca:—of the meaning for the necessity of a clausium in *Clausilia*, again using this term in its original and broader sense.

If, as Dr. Soós states, *Alopia* is the most archaic genus of the Clausiliidæ, why have we got *Ithyption livida*, with its simple armature and columella, existing in immense numbers on the northern side of the Bucsecs, the Bodga Mts., Mt. Vulcan and the Ordinkus valley, while a form called var *maxima* Schm. from a restricted locality, the Magura, a mountain ridge beyond the Bucsecs, has developed columella lamellæ, though no clausium? What stage in the process of evolution does this form represent? Soós throws no light on the point and, while criticism would seem to be unjust, it would appear

¹ The Clausium in *Alopia*, *J. of Conch.*, vol. xv, pp. 262-267, 1918.

² The genus *Alopia*, A. H. Cooke, *J. of Conch.*, vol. xix, p. 34, 1930.

that a more studied attempt to solve the problem of mutation in this species should have been attempted. The difficulty lies in the fact that *Alopi*a will not live, except at these high altitudes.

Whether or not an exact parallel exists in the sinistral species it is not quite possible to tell. *Alopi*a *straminicollis* Charp. is an *Ithyption*. The *A. straminicollis* Parreyss, so named in most collections, is now identified as *A. plumbea* var. *schmidti* Kim. 'The true *straminicollis*,' Soós says, 'was really hitherto unknown.' He says further 'no clausilium; its first traces, however, may be recognised in the form of a short lamella sitting on the columella and corresponding to the pedicle of the clausilium.'¹ This would seem to suggest that from this point in the evolution of the genus both sinistral and dextral species pass, on the one hand, to a highly developed clausiate type, and on the other to a rapidly declining archaic series. It is also interesting to note that at this stage of development there occur six out of the eight sinistral forms which have an exact dextral counterpart, with one exception, which is only conchologically mirrored.

It must be remembered that both Bielz and Wagner considered these "mirror-images" as dextral and sinistral forms of one and the same species. But, as Soós says, no two authors seem to be agreed as to the correct nomenclature of this difficult group.

The following table will perhaps bring out more clearly the relationship of the genus, and the reasons given for dividing the clausiate from the non-clausiate species.

Classification of *Alopi*a; nomenclature as adopted by Soós, but arranged according to absence or presence of clausium; the numbers in brackets show the order of species in Soós' classification: "mirror image" species shown by —————

***Alopi*a** H. and A. Adams, 1855.

Type—***Clausilia bielzii*** Pfeiffer 1848.

Section ***Ithyption*** Dean 1918.

Type—***Alopi*a *lactea*** (Bielz) 1853.

SINISTRAL

DEXTRAL

A. glauca Bielz (1).

var. ***latens*** Pfr.

A. cyclostoma Bielz (2).

var. ***albicostata*** Kim.

A. lactea Bielz (3).

var. ***nefaria*** Kim.

var. ***transitans*** Kim.

var. ***costata*** Bielz.

¹ Soós, op. cit. p. 396.

var. *inornata* Kim.

var. *cæsarea* Kim.

var. *striaticollis* Kim.

var. *mauritii* Kim. ~~—————~~ *A. nefasta* Kim. (12).

var. *costicollis* Kim.

var. *proxima* Kim.

var. *ambigua* Kim.

var. *haueri* Bielz.

var. *laticosta* Bttg.

var. *mirabilis* Kim.

A. nixa Kim. (4)

conchologically only ~~—————~~ *A. livida* var. *minima* A. Sch.

A. straminicollis Charp. (5).

~~—————~~ *A. livida* var. *sororcula* Soós.

var. *novalis* Kim. ~~—————~~ *A. livida* var. *bipalatalis* Kim.

var. *druyvesteijni* Soós.

~~—————~~ *A. livida* Menke (13).

A. livida var. *minor* Bttg.

A. livida var. *maxima* Sch.

A. helenæ Kim. (14)

var. *heliana* Kim.

Section *Alopiæ* s.s. = *Transsilvanica* Westerlund 1890.

Type—*Clausilia bielzii* Pfr.

A. intercedens Rossm. (6)

~~—————~~ *A. meschendorferi*

var. *cybæa* Kim.

var. *connectens* Soós.

A. meschendorferi

var. *hypula* Soós.

var. *boettgeri* Kim.

~~—————~~ *A. meschendorferi*

var. *obesa* Kim.

var. *monacha* Kim.

A. meschendorferi

var. *jekeliana* Soós.

var. *subita* Kim.

A. meschendorferi Bielz (15).

A. plumbea Rossm. (7).

var. *schmidtii* Kim.

var. *bellicosa* Kim.

A. regalis Bielz (8)

var. *adventicia* Kim.

var. *mutabilis* Kim.

var. *valachiensis* Bttg.

var. *mathildæ* Kim.

var. *deubeli* Westl.

var. *wagneri* Kim.

var. **proclivis** Kim.

var. **princeps** Soós.

A. fussiani Bielz (9). ————— **A. lischkeana** Charp. (16)

var. **diabolina** Kim.

var. **grandis** Bielz.

var. **insignis** Bielz.

var. **violacea** Kim.

var. **elegans** Bielz.

A. bogatensis Bielz. (10)

var. **angustata** Bielz.

A. occidentalis Bttg. (11)

var. **jickeli** Kim.

var. **microstoma** Kim.

var. **vicina** Kim.

A. bielzii Pfr. (17)

var. **madensis** Fuss.

var. **tenuis** Bielz.

var. **clathrata** Rossm.

One word as to the conchological side of our subject. Within recent years 'systematists have placed great hopes in the radula, thinking that the differences in its structure will enable them to distinguish not only families and genera, but even species. Personally I think the facts have not justified such hopes, and the importance of the radula as a systematic character is greatly exaggerated. Of course I do not mean to deny the importance of the radula in systematics altogether, as I believe it presents a well defined character in families.'¹ 'The shell, in spite of what some soft anatomists would preach, is the soundest single element that one can use in the classification of mollusca. It is comparable, as far as its value for classificatory purposes is concerned, to the skeleton of mammals, birds, reptiles, batrachians and fishes, that is, the Vertebrates. I believe no one will challenge the use of the skeleton of Vertebrates for that purpose, and in molluscs this use is even less assailable, for in the molluscan skeleton, unlike that of the vertebrate, we have the story of the entire ontogeny of the animal engraved upon its skeleton. We are therefore able to see, on a perfect specimen of a shell, the sculptural characters that were impressed upon the parts that develop while the animal was still in the egg or the uterus of the parent, as well as the subsequent additions of characters acquired during the various phases intervening between the egg and the senescence. . . .'²

It has been stated that the clausium is unreliable³ though there is no reference given to the particular examinations which must

¹ Roszkowski: Ann. Mus. Zool. Polonici, vol. viii, p. 69, 1929.

² Bartsch, "Science" vol. 73, p. 419, 1931.

³ Proc. Malac. Soc., vol. xv, p. 301.

have led up to this statement. As far as *Alopiæ* is concerned an examination of the clausia illustrated in a previous journal by the present writer¹ will at least show an almost uniform type; not only so, but with the nomenclature revised help to prove how completely Dr. Soós is right in his analysis. But allowances must be made for the growth of the clausium, and about this there is much to be learned and understood. In *Alopiæ* there is a gradual thickening of the outer lobe of the spatula. The clausium of a specimen which is obviously freshly grown and the shell only recently completed will have a narrow outer lobe and a correspondingly large orifice. As the lobe thickens with age this orifice becomes reduced in size. In order, therefore, to get reliable results only the best specimens must be used, and a series examined. But in work of this sort there is a decided reluctance to sacrifice a beautiful specimen for the sake of a clausium, and quite possibly this very fact has led to poor specimens being used with unreliable results. Weathered specimens can always be selected and are often the best.

The Bosnian group *Herilla* is now classified under *Alopiæ*. Just as in *Alopiæ* where there is the passage from the non-clausiate shell to the clausiate form, so in *Herilla* we see the passage from the bilobate type of clausium to that with the spoon-shaped spatula—the entire clausium—characteristic of most of the Clausilias with the exception of *Marpeasa* and *Triloba*.

Herilla H. and A. Adams, 1855.

Type—**Clausilia dacica** Pfr. 1848.

Section **Balcanica** Kennard & Woodward, 1923.

Monotype—**Clausilia frivaldskiana** Rossm.

H. frivaldskiana Rossm.

Section **Herilla** s.s.

H. dacica Pfr.

H. bosniensis Pfr.

H. travnikana Branck.

Herilla frivaldskiana Rossm. as well as other species or geographical varieties cannot be dealt with till examples are seen and examined. The group is however a small one of less than a dozen species, some almost impossible to obtain.

The clausium in *H. dacica*, *H. travnikana* and *H. bosniensis* has been examined. The clausium of *dacica* is bilobate with a large orifice separating the outer and inner lobes, the outer lobe being short and hook-shaped. The clausium of *travnikana* may be taken as intermediate in type between the type-species and *bosniensis*. In this

¹ *J. of Conch.*, vol. xv, plate 6,

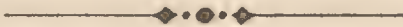
the orifice has nearly disappeared, and while the outer lobe is prominent the inner one is nearly obliterated by the closing in of the orifice. In *bosniensis* this closing up is complete: the original position of the lobes is discernable but the orifice is now completely filled in. Were these three species the only ones to be considered we should have in *Herilla*, a most reliable method of determining each of the species by the clausium alone.

Section **Attica** Bttg., 1877.

Monotype—**Clausilia guicciardii** Heldr.

H. guicciardii Heldr.

This species has always been placed by systematists in the genus *Alopi*a. There is however considerable shell resemblance to species of the *dacica* type, both in embryonic whorls and armature. The clausium also possesses characters which might suggest that it represents an isolated survival of the same stock from which *Herilla* originated.



Malformation in *Mya arenaria* L.—Some years ago, while looking over a number of valves of *Mya arenaria* L. from Greenisland, which is 9 miles from Belfast, on the north side of Belfast Lough, I noticed that some had a curious malformation which does not seem to have been observed previously. This consisted in the innermost layer of shelly matter, in the area enclosed by the deep sinus formed by the pallial scar, being raised and separated from the rest of the shell proper, forming a kind of raised blister opening at the posterior end. Jeffreys (B.C., v. 3, p. 64) mentions a monstrosity of *M. arenaria* which is “furnished inside with foliaceous plates, showing a laminated structure,” from Exmouth, which seems to be rather like the one I found. The comparative frequency of the malformed specimens made me wonder if a distinct race with this peculiarity existed in the neighbourhood. A number of complete specimens and also some odd valves picked up at random, totalling altogether 100 valves, was carefully examined. Those malformed as described above numbered exactly a dozen, about as many more showed slight traces of the malformation, and the remainder were normal. I would not, however, in the absence of a large series of live specimens, like to say definitely that there is, in Belfast Lough, a distinct race differing thus from the normal, though there is an unusually large proportion of malformed specimens, as detailed above. I have not observed the malformation in any of the many sets of *Mya arenaria* from other parts of the Irish coast which I have examined—possibly because the finest and most shapely specimens would naturally be selected.—N. FISHER.

NOTES ON SOME SCOTTISH AND SHETLAND PISIDIA.

By CHAS. OLDHAM.

(Read before the Society, April 9th, 1932).

VISITS to the Shetlands, Pomona, the largest of the Orkneys, and places in the north of Scotland in the summers of 1927, 1928, 1929 and 1931 afforded opportunities for searching for *Pisidia* in the lochs which, especially in Shetland, occupy a considerable portion of the land surface. The waters visited range in altitude from sea-level to nearly 1,000 ft. (Loch Tarff, Easterness) and in size from considerable lakes such as Loch Brora (Sutherland East), four miles, and Loch of Cliff (Shetland) two miles and a half in length, to small pools not three hundred yards across. Some, particularly those on blown sand, are so shallow that one can explore the whole of the bed by wading, whilst the Loch of Kirbister (Orkney), although a mile and a quarter long, is said to be nowhere more than six feet in depth, and Loch Scarmclate (Caithness), a mile long, barely as deep. On the other hand, in Easterness, Loch Tarff reaches 89 feet and Loch Ruthven 40 feet; in Sutherland East, Loch Brora, 66 feet; in Caithness, Loch Calder, 85 feet; whilst in Shetland, the Loch of Cliff is 21 feet, Eela Water, 55 feet, Loch Spiggie, 41 feet and Tingwall Loch 60 feet deep; but these depths are trifling compared with the profundities of Loch Ness and other waters in the Great Glen. I had no means of exploring the deeper parts of the lochs, and my collecting was done perforce from the bank or by wading, but so far as could be seen, the shallower and consequently accessible parts of the deeper lochs furnish the same conditions and support similar faunas to the beds of the uniformly shallow ones.

All are alike in the clarity of the water and the clean nature of their beds, whether of stone, grit, silt, or, especially in areas of blown sand, as on Bressay, at Dunrossness and Norby in Walls, of clean, hard sand. In some cases the actual bottom was covered here and there to a depth of six inches by a deposit of granular peat, derived from the disintegration of the banks and quite different from the squashy surface of the peat-bogs. The lochs with stony beds can be matched by many of the lakes and tarns of Cumbrian and Cambrian hills, as can those with beds of pure sand by some of the shallow llyns at sea-level in Anglesey. Of vegetable mud there is almost none, but in the few restricted spots where there is any its effect on the *Pisidium* fauna is very noticeable; indeed the result of my collecting convinced me that the determining factor in the occurrence of some, and the relative abundance or scarcity of other species was not the alkalinity or acidity

of the water—although this was not tested—but the nature of the bottom.

There is only a meagre vegetation; small and scarce patches of *Menyanthes*, *Potamogeton* and *Sparganium*, with, in sand or silt, thin beds of *Equisetum*; but compared with a mere in the English Midlands the lochs are virtually devoid of higher plants. The molluscan fauna is equally poor. In several lochs I could find no *Pisidia* at all, although a longer and more intensive search might have yielded different results. I did not see *Sphærium corneum* in any loch¹—it occurs in stony lakes in Wales and Cumberland—but it was in a stream running into Loch Watten (Caithness). *Limnæa pereger*, which varied a good deal in different waters, is not uncommon but *Planorbis glaber* less so. Both, like the *Pisidia*, are preyed upon by the trout that abound in most of the lochs. I have seen stomachs of the fish tightly packed with the snails. *Valvata piscinalis* and *Ancylus fluviatilis* are in Loch Scarmclate, and *Paludestrina jenkinsi* in the Loch of Mey (Caithness).

Elsewhere than in the lochs I collected very little. The acid bogs that occupy so much of the country furnish few congenial habitats for *Pisidia*, but in pools and trickles I found *cinereum*, *personatum* and the form of *obtusale* which is characteristic of peaty water, and, much less frequently, *subtruncatum*. In vegetable refuse in a peaty pool near the Flichity Inn, Dunlichty (Easternness) occurred a strongly striated form of *milium*, associated with *cinereum*, *obtusale* and *hibernicum*. It was impracticable to search the whole of the margins of the lochs, except the smallest. The method adopted was to hunt in what seemed to be a likely place, and then, if *Pisidia* were found, to concentrate on an area of a few square yards, thus ensuring that the different species, if more than one were present, were living in actual association. Several places might be tried in one loch. As a rule, and provided the loci were similar, they gave like results, but, anyhow, it may be taken that the gatherings recorded in the appended schedule do represent actual associations except in the case of the Mill Loch on Foula—of which more hereafter.

Twenty-four of the scheduled loci yielded *lilljeborgii*. In five (23, 28, 29, 32, 34, 35) it occurred alone, but thrived in the seemingly austere conditions—silt or pure sand—which these loci afforded, conditions often intolerable to other species, especially *milium* and *obtusale*. Its most frequent associates were *nitidum* (12 cases), *cinereum* (11) and *hibernicum* (11), all species of catholic tastes. Indeed in the Loch of Cliff (in a different locus from 26) and Loch

¹ Recorded from Loch of Kirbister, Orkney by Jones and Kennard, Proc. Malac. Soc. xiii, p. 148.

Spiggie (37) *nitidum* was abundant in pure sand, and not associated with any other species. The association of *lilljeborgii* with *personatum* in the Mill Loch, Foula (24) is only apparent, for although reached by my scoop from the same stance, the *lilljeborgii* were alone in gritty sand, whilst the others, *cinereum*, *personatum*, *obtusale* and *nitidum* were in boggy ground where a field drain entered the loch. At one locus (19) in the loch of Kirbister (Orkney) *lilljeborgii* was living in sandy silt, associated with *hibernicum*. A short distance away (20) was a muddy hole which harboured a very different association, *subtruncatum*, *miliun* and *pulchellum*. The shallow, sandy Loch of Hillwell (Shetland) furnishes a similar case. In sandy silt (38) *lilljeborgii* was living with *cinereum* and *nitidum*. In another part of the pool (39) there is a thick bed of *Equisetum* and a good deal of vegetable mud. Here both *cinereum* and *nitidum* occurred, but associated with *subtruncatum* and *miliun* and there were no *lilljeborgii*. English and Welsh tarns afford parallel cases, and here, too, the most frequent associates of *lilljeborgii* are *nitidum*, *hibernicum* and *cinereum*. Occasionally it is found alone, e.g. in Llyn Llync y Caws, a tarn with a stony bed at 2,000 feet in the Berwyn mountains, Denbighshire (12, x, 1922), and in peaty silt about the roots of *Lobelia* in Llyn y Garn, at 1,450 feet, near Trawsfynydd, Merionethshire (21, ix, 1921). In Angle Tarn, Patterdale, Westmorland, at 1,550 feet (10, vi, 1918) it was found alone among the roots of *Lobelia* and *Isoetes* in silt; in another part of the tarn where *Equisetum* and *Potamogeton* were growing, there were no *lilljeborgii* but *cinereum* and *subtruncatum*. In Llyn Du, Meifod, Montgomeryshire (12, x, 1920) *lilljeborgii* and *hibernicum* were associated with a few *miliun* in coarse silt, but in mud near the outlet *miliun* was abundant and with it were *subtruncatum* and *cinereum*. In Kelly's Lough, a tarn at 2,000 feet on Lugnaquilla, Co. Wicklow (8, viii, 1929) *lilljeborgii* was restricted to one spot, where the bottom was coarse silt; *cinereum*, too, was only in one place—in peaty mud among *Littorella*—whilst *hibernicum*, avoiding the grit, was in peaty mud about the boggy edges of the lough. Gormire, in the Hambleton Hills, Yorks. (12, viii, 1928) furnishes another instance of the fastidiousness of *lilljeborgii*, which seemed to eschew the black vegetable mud in which *cinereum*, *miliun* and *nitidum* were living.¹ In the Shropshire Union Canal, at Llangollen, Denbighshire (19, ix, 1921), in clear, flowing water with a bed of muddy silt, suggestive of a river rather than a canal, *lilljeborgii*² was associated with *amnicum*, *pulchellum*, *nitidum*, *subtruncatum*, *henslowanum*,

¹ *J. of C.*, xviii, p. 294.

² A single specimen was collected. *J. of C.*, xvi, p. 287, but on a subsequent occasion I collected many.

hibernicum and *miliun*, an association quite different from that obtaining in stony lakes or tarns.

Although *pulchellum* occurs in Orkney (20) there is no reliable evidence of it in Shetland. Specimens from Bressay in the Mac Andrew collection at Cambridge, referred by B. B. Woodward¹ to this species are rather strongly striated *nitidum* and *lilljeborgii*. It is curious that, relying so much as he did upon the hinge-teeth for identifying *Pisidia*, Woodward should have ignored the ligament-pit, a character often of the first importance. The deep, broad, crescent-shaped ligament-pit of *pulchellum* is entirely different from the long narrow pit of *lilljeborgii*, and is quite diagnostic. The iridescent, ribbed sculpture of *pulchellum* differs in kind from that of the most strongly striated *lilljeborgii*, the lateral teeth are shorter and stouter, and the cardinals, especially C₂, very different, but, even so, Woodward fell into error which due consideration of the ligament-pit might have averted. The shells from Ffynnon Llugwy, Carnarvonshire (17, ix, 1911) which he identified as *pulchellum*,² proved on re-examination to be *lilljeborgii* and *cinereum*. Woodward (*in lit.* 17, xi, 1917) agreed with my determination so far as *lilljeborgii* was concerned, but referred to the shells which I regard as *cinereum* to *nitidum* (i.e. *nitidum* of Woodward non Jenyns). Other evidence of his difficulty in distinguishing between *lilljeborgii* and *pulchellum* may be found in the remarks in his *Catalogue* (p. 80) on specimens from Silverdale, Lancashire. Apparently he failed to discriminate between the two until after the plates in his work had been printed. Incidentally, in a much wider experience of collecting *Pisidia* than I had in 1911, I have never found *pulchellum* in a mountain tarn. Its characteristic habitat is mud in ditches and slow-flowing streams, with clean water.

P. henslowanum was found in only two stations. Specimens from Loch of Mey (Caithness) are, apart from their appendiculæ, very like the associated *lilljeborgii*, and the same may be said of the single specimen collected in Hellier's Water (Shetland). A. W. Stelfox (*in lit.*) refers them to his var. *distans*.

Among the shells collected in Loch cé Glais (2), a shallow tarn at 763 feet, with a stony bed, peaty in places, and an open situation which ensures much direct sunlight, A. W. Stelfox detected a single example of *P. conventus*—now in the Society's voucher collection. As little is known about it, it may be fitting to say something here of the British status of this species.

On Sept. 24th, 1910, A. W. Stelfox and R. Welch found in cold-water tarns in Conmaknock, at 2,000 feet to 2,300 feet on Brandon

¹ *Catalogue of Brit. Species of Pisid. in Brit. Mus.*, p. 82.

² See my note in *J. of C.* xi, p. 353 and his *Cat.*, p. 82.

Mountain, South Kerry, a small *Pisidium* which they were unable to assign to any of the then recognised British species. Specimens submitted to B. B. Woodward were named by him *pusillum*; he also attributed to *pusillum* some small shells collected at depths between 250 feet and 700 feet in Loch Ness, Easternness, by W. M. Webb, on Oct. 29th, 1903.¹

During 1915 and 1916 I collected *Pisidia* extensively in lakes and tarns in the Carnarvonshire Mountains, and sent many specimens which puzzled me to Woodward and Stelfox for their opinions. On June 15th, 1915, I took *lilljeborgii* abundantly in Llyn Cwm Clyd, a small tarn at about 2,000 feet on Y Garn in Nant Ffrancon. With the *lilljeborgii* were a few examples of a smaller species, the like of which I had not seen before. Woodward referred them to *nitidum*.² On July 17th, 1916 I found the same small species again, in abundance—but the only *Pisidium* there—in the smaller, and shallow, tarn in Cwm Glas, Snowdon, at 2,400 feet. These, oddly enough were referred by Woodward, not to *nitidum*, but (*in lit.*) to *casertanum* (= *cinereum*). Stelfox at once recognised that, whatever they might be called, the little shells from Llyn Cwm Clyd and the Cwm Glas tarn were conspecific with those from the tarns on Brandon Mountain; and it is noteworthy that, like the Kerry tarns, the two Welsh ones have a northerly aspect and are bounded on the south by precipitous mountain faces, situations that involve a minimum of sunlight, and cold water in consequence. Interest in the Kerry shells was revived by my Welsh finds. Influenced chiefly by the weak hinge, and regardless of the periostracum which was not at all that of *nitidum*, I inclined to that species, by which I mean the *nitidum* of Jenyns, which is apparently *pusillum* (later *pusillulum*) of Woodward.³ The *nitidum* of Woodward seems to have a catholic meaning. Specimens in my collection assigned to *nitidum* in his *Catalogue* (pp. 48-49) and others so named by him subsequently include what seem to me undoubtedly to be *hibernicum* (a species little understood by British conchologists in 1913, when the *Catalogue* was published, and for some time afterwards; see pp. 214-218 of Woodward's paper, *Notes on some species of Pisidium*, *Proc. Mal. Soc.* xiv), inappendiculate *henslowanum*, *cinereum*, *personatum*, and the real *nitidum* of Jenyns. But, be that as it may, there can be no question whatever of the specific identity of the shells from Nant Ffrancon and Cwm Glas, and it is interesting that Woodward should have referred the former to *nitidum* and the latter to

¹ *Cat. cit.*, p. 65.

² *Cf.* my note *J. of C.*, xv, p. 96.

³ Thirteen sets in my collection, all to my mind assignable without question to Jenyns' *nitidum* are referred by Woodward to *pusillum*. See his *Catalogue*, pp. 64-66. *Cf.* too Stelfox, *J. of C.*, xv, pp. 235-239.

casertanum (= *cinereum*) for, although at first Stelfox inclined to my view that the shells were an unusual form of Jenyns' *nitidum*, we both came to the conclusion later that they were more likely to be a depauperate and quite exceptional form of *cinereum*, and it seemed best so to regard them unless and until this peculiar and usually easily recognisable form should be found somewhere living in association with a *Pisidium* that accorded better with our notion of *cinereum*.

In Oct. 1921 Woodward sent me some of the Loch Ness material which Webb had collected—at a depth of 400 feet—in 1903. Seeing that Woodward had assigned the shells to *pusillum*,¹ I expected Jenyns' *nitidum* but, on a nice examination, found them to be two species, *personatum* and the puzzling creature that lives in the cold tarns in Kerry and Carnarvonshire, which, at that time, I regarded as a depauperate *cinereum*. Woodward, after re-examining the shells, concurred.

Meanwhile, Stelfox had been corresponding with N. H. Odhner in Stockholm, and had sent him specimens of the Brandon Mountain and Cwm Glas shells. He identified them with his *P. tornense*² (a name antedated by *P. clessini* Surbeck,³ which in turn has since been found to be antedated by *P. conventus* Clessin). In Sept. 1921 I collected and sent to Odhner living specimens from Llyn Cwm Clyd and Cwm Glas. An examination of the soft parts convinced him of the identity of our shells with *clessini* (= *conventus*).⁴ Writing to me on the subject of the identity of *conventus* and *cinereum*, Nov. 21st, 1921, Odhner says "In my opinion this form is a good species, well different from *P. casertanum* [i.e. *cinereum*]. In Swedish Lappland these two live together in small alpine tarns, which speaks in disfavour of the assumption that *clessini* is a dwarfed *casertanum*." Kennard and Woodward in 1926,⁵ with perhaps commendable caution, still hesitated to refer the British specimens to *conventus*, but in 1929 Stelfox, buttressed by J. Favre's observations on the association in the in the Lake of Geneva of fine, robust examples of various forms of *cinereum* with *conventus*⁶ which confirmed and extended those of Odhner, concluded that *conventus* is established as a distinct species, and that, after a somewhat chequered history, it is entitled to a place

¹ *Cat.*, p. 65.

² Regarded by Woodward as a synonym of *pusillum* (i.e. presumably *nitidum* Jenyns). *Cat.*, p. 60

³ N.H.O. *On some species of Pisidium in the Swedish State Museum. J. of C.*, xvi, pp. 218-223.

⁴ *On the Anatomical Characteristics of some British Pisidia. Proc. Mal. Soc.*, xv, pp. 155-161.

⁵ *Synonymy of the British Non-Marine Mollusca*, p. 327.

⁶ *Les Mollusques du Bassin de Genève. Mém. Soc. de Physique et d'Histoire Naturelle de Genève*, xl, p. 300

on the British List,¹ a conclusion which will no doubt meet with general acceptance. The occurrence of *conventus* in Loch cé Glais made me hope for its discovery in Shetland, but so far that hope has not been realized. It is perhaps more likely to be found in some of the cold water tarns on the Scottish mountains or, in view of its living in Loch Ness, at great depth in some of the larger lakes, such as Loch Arkaig and Loch Lochy in the Great Glen. Stelfox's statement¹ that *conventus* occurs in the English Lake District was, he informs me, made under a misapprehension. Whilst it may exist in some of the cold-water tarns of that area there is, so far as I know, no evidence that it actually does so.

The *nitidum* of Loch of Mey (Caithness) is referred by Stelfox to a rather depauperate form of his var. *arenicola*.

1 Proc. Roy. Irish Acad., xxxix, B1, p. 8.

Locus				Date of collection	<div> <i>P. cinereum</i> Alder <i>P. conventus</i> Cless. <i>P. personatum</i> Malm. <i>P. obtusale</i> (Lam.) <i>P. subtruncatum</i> Malm. <i>P. henslowianum</i> (Shepp.) <i>P. liljeborgii</i> Cless. <i>P. hibernicum</i> Wester. <i>P. nitidum</i> Jenyns <i>P. pulchellum</i> Jenyns <i>P. nilium</i> Held. </div>											No. of associated species
					1	2	3	4	5	6	7	8	9	10	11	
	EASTERNESS (Comital Div. 96)															
1	Loch Mhor, Foyers	...	...	23,vii,27	×				×		×		×			4
2	Loch cé Glais, Dunlichty	...	...	23,vii,27	×	×					×					3
3	Loch Ruthven, Dunlichty	..	...	24,vii,27	×						×					2
4	Loch Tarff, Fort Augustus	...	...	26,vii,27					×		×	×	×		×	5
	SUTHERLAND E. (Comital Div. 107)															
5	Loch Brora	...	...	20,vii,27	×						×		×			3
	SUTHERLAND W. (Comital Div. 108)															
6	Loch Mor, Bettyhill	...	...	28,vii,28								×				1
7	Loch Chuibhe, Bettyhill	...	...	28,vii,28				×			×	×	×			4
8	Loch Druim an Duin, Bettyhill	...	...	28,vii,28	×								×			2
9	Airidh na Creige, Bettyhill	...	...	31,vii,28								×				1
10	Nameless Loch near Farr...	...	...	28,vii,28				×	×			×			×	4
11	Loch Mor, Melvich	...	...	3,viii,28	×		×	×				×				4
12	Loch Beag, Melvich	...	...	3,viii,28			×	×				×				3
	CAITHNESS (Comital Div. 109)															
13	Loch Olginney, Hallkirk	...	...	9,vii,27	×						×	×	×			4
14	Loch of Mey, Mey	...	...	11,vii,27	×				×	×	×	×	×			6
15	St. John's Loch, Dunnet	...	...	11,vii,27	×								×			2
16	Loch Scarmclate, Hallkirk	...	...	8,vii,27			×					×	×			3
17	Loch Calder, Hallkirk	...	...	9,vii,27	×						×	×				3
18	Coghill Loch, Thurso	...	...	10,vii,27								×				1

Locus		Date of collection	<i>P. cinereum</i> Alder	<i>P. conventus</i> Cless.	<i>P. personatum</i> Malm.	<i>P. obtusale</i> (Lam.)	<i>P. subtruncatum</i> Malm.	<i>P. henslowianum</i> (Shepp.)	<i>P. liljeborgii</i> Cless.	<i>P. hibernicum</i> Wester.	<i>P. nitidum</i> Jenyns	<i>P. pulchellum</i> Jenyns	<i>P. nilium</i> Held.	No. of associated species
			1	2	3	4	5	6	7	8	9	10	11	
	ORKNEY (Comital Div. III)													
	Loch of Kirbister, Ophir	19,vii,28												
19	(a) sandy silt...								x	x				2
20	(b) mud ...						x					x	x	3
	SHETLAND (Comital Div. II2)													
	BRESSAY													
	Lochs of Boesetter	15,vii,28												
21	(a) northernmost ...		x						x					2
22	(b) westernmost ...		x				x		x	x	x			5
23	Sand Vatn	15,vii,28							x					1
	FOULA													
24	Mill Loch	3,vii,29	x	x	x				x		x			5
	UNST													
25	Hellier's Water ...	3,vii,28						x	x	x	x			4
26	Loch of Cliff (stomachs of trout)...	vii,31							x	x	x			3
	MOUSA													
27	Nameless loch near the Broch ...	13,vii,28									x		x	2
	MAINLAND													
28	Loch of Voxterby, Walls...	27,vi,28							x					1
29	Burga Water, Walls ...	27,vi,28							x					1
30	Loch of Mousavord, Walls ...	27,vi,28					x							1
31	Staneyatstoe Loch, Walls ...	27,vi,28								x				1
32	Loch of Flatpunds, Walls ...	27,vi,28							x					1
33	Lunga Water, Walls ...	27,vi,28	x		x	x				x	x			5
34	Loch of Norby, Walls ...	26,vi,29							x					1
35	Loch of Grunnavae, Walls ..	29,vi,28							x					1
36	Loch of Tingwall, Scalloway ...	18,vii,28							x	x	x			3
37	Loch Spiggie, Dunrossness ...	9,vii,28									x			1
	Loch of Hillwell, Dunrossness	10,vii,28												
38	(a) sandy silt ...		x						x		x			3
39	(b) vegetable mud ...		x				x				x		x	4
	Eela Water, North Mavine	vii,31							x	x				2
40	(stomachs of trout) ..													
			16	1	4	6	9	2	24	20	19	1	5	107



RUMINA DECOLLATA L. IN CAPTIVITY.

By H. E. J. BIGGS.

ON 22nd Nov., 1930 I received a number of shells from the hills behind Algiers, amongst them some very young specimens of *R. decollata*, L. They were dormant; I placed them in a small jar with earth and planted some grass. In March, 1931 they began to be active and fed on potato, carrot and turnip, hiding under the food during the day and coming out at night. Sometimes they would bury themselves in the earth for days. By May 23rd three of the number appeared to be doing well, the two largest having seven and six whorls respectively.

My work prevented me from making many observations for the next few months but under date July 31st I have the following note: "As I have seen nothing of them for the last few days I pulled up the grass growing in the jar. The surface of the earth was undisturbed but they were buried at the bottom of the jar about one and a half inches below the surface."

Early in August I transferred them to a larger jar in which were earth and sand in equal proportions. They lived there till October 2nd, when I conveyed them in a small tin to Persia. On arrival, I measured them and put them again in a jar and they became active after the month's enforced rest and fed on potato. All three seemed healthy. Lengths: (1) 16.4 mm.; (2) 12.6 mm.; (3) 13.2 mm. About January 16th No. 1 died; it measured 17.2 mm. and had lived in captivity $13\frac{1}{2}$ months. The other two were (2) 14.8 mm. and (3) 15.5 mm. On March 16th, exactly two months later, the lengths were (2) 20.2 mm. and (3) 21.3 mm. The latter occupied only $3\frac{3}{4}$ whorls of the shell; the remaining 6 whorls were losing colour and in one place wearing away. It was so fragile that it broke off at this point when put back in the jar after measurement. Sometime after this No. 2 decollated itself. Two and a half months later (June 1st) No. 2 was 22.2 mm. (plus 2.5 mm. decollated) and No. 3 was 21.7 (plus 4.5 mm. decollated). On the following day both were found to be dead. I have no suggestion to offer as to the cause of death. A few days before both were at the top of the jar crawling on the punctured stopper; I thought that perhaps some decaying cucumber, a favourite food, was annoying them so cleaned the jar and put them back. One climbed again but the other never recovered. Both seemed to be trying to cover the mouth of the shell with calcareous matter. This summer has been very hot in Persia but the jar has been standing on a shelf protected from the sun. It is possible that I had kept the jar too damp and they were climbing to aestivate in the sun. These two shells had lived 18 months in captivity.

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN & IRELAND.

594th Meeting, held at Leeds in conjunction with the Leeds Branch,
November 14th, 1931.

Mr. Armstrong, President of the Leeds Branch, in the chair.

An address was delivered by Mr. F. Taylor of Oldham on British Non-Marine Mollusca, illustrated by a very fine assemblage of shells, eggs and darts from his own collection.

Exhibits.

By Mrs. Morehouse: series of *Acavus*.

By Mr. North: Japanese *Eulota*.

By Mr. A. K. Lawson: series of *Geomitra* from Madeira.

By Mr. Armstrong: *Cerion* from Cuba.

By Mr. Howell: Living *H. nemoralis* with epiphragm.

By Mr. C. H. Moore: series of *Terebra*.

By Mr. H. Crowther: *H. aspersa*, *H. hortensis* and *H. nemoralis* from Truro: malformed *L. peregra* and *L. stagnalis* from the Leeds neighbourhood; also a series of shells illustrating mouth-protection.

595th Meeting, held at the Manchester Museum, December 2nd, 1931.

Mr. G. C. Spence in the chair.

Additions to Library.

"Notes on Medical Microscopy, A Review of the Microscopy of Radulæ, and Radulæ of Mollusca," by E. W. Bowell.

"Notes on malformed specimens of *Anodonta cygnea* and note on the anatomy of *Lamellidens marginalis* and *L. thwaitesii*," by H. H. Bloomer.

"The types of Lamarck's Genera of shells selected by J. G. Children in 1823," by A. S. Kennard, A. E. Salisbury and B. B. Woodward.

"Local extinction of a recently abundant mollusk," by Miss N. Fisher.

"*Anodontites*, a genus of South and Central American and Mexican pearl-bearing mussels," by William B. Marshall.

All presented by the authors.

Additions to the Cabinet.

Planorbis vorticulus and *Vertigo lilljeborgi* by A. E. Boycott.

Drepanostoma nautiliforme by Hans Schlesch.

Papers Read.

"Anatomical notes on *Margaritifera* Schumacher," by H. H. Bloomer, F.L.S.

"The Clausilium with special reference to *Alopia* and *Herilla*," by J. Davy Dean, F.E.S.

"Notes on *Eledone cirrosa* Lam." by R. Rendall.

"Obituary Notice: O. Nordgaard," by Hans Schlesch.

"Life History of *Myxas glutinosa*," by J. E. Cooper.

"J. W. Taylor (1845-1931)," by A. E. Boycott.

"Note on *Viviparus contectus*," by C. Oldham.

Exhibits.

By Mr. G. C. Spence:—Series of *Streptostele*.

By Mr. C. H. Moore:—Series of *Ricinula*.

596th Meeting, held at the Manchester Museum, January 6th, 1932.

Mr. G. C. Spence in the chair.

Addition to the Library.

"Notes on West American Shells," by Dr. Bartsch.

Resignations.

E. E. Perry.

D. B. Macauley.

The Accounts and Balance Sheet for 1931 were read and duly approved.

Exhibits.

By Mr. A. K. Lawson:—Japanese toys manufactured from bivalves.

By Mr. C. H. Moore:—Series of *Bulla*.

The special exhibit was large and small specimens of British *Helices*, of which a number of interesting forms were shown.

By Mr. Hans Schlesch:—*Potadoma graptoconus*, French Congo; *Lanistes sinistrorsus*, Sikonge, Tabora.

597th Meeting, held at the Manchester Museum, February 3rd, 1932.

Mr. G. C. Spence in the chair.

Additions to the Library.

Three papers by Hans Modell. (From the author).

Two papers by Hans Schlesch. (From the author).

Two papers by H. I. Tucker. (Presented by C. Oldham).

Resignations.

J. R. B. Masefield.

W. S. Brown.

Papers Read.

"Additional Notes on the Land and Freshwater Mollusca of Sussex: Forms of *Helix aspersa*," by J. Gordon Dalglish, F.L.S.

"Note on the true genus of *Doris kalkensis* Barnard," by Dr. K. H. Barnard.

"Notes on the Land Mollusca of the Malay Archipelago," by Miss T. Van Benthem Jutting.

"Note on Mollusca eaten by Rabbits," by A. K. Lawson.

Exhibits.

By Mr. A. K. Lawson:—*L. involuta*, also shells to illustrate his paper.

By Mr. C. H. Moore:—Specimens of *Patella* showing varied colouration.

The special exhibit was *L. truncatula* and *L. palustris*.

598th Meeting, held at the Manchester Museum, March 2nd, 1932.

Mr. G. C. Spence in the chair.

Additions to Library.

"A New Marine Shell genus *Xenophora* from Florida," by Paul Bartsch.

The British Association Report for 1931.

Candidate Proposed for Membership.

Robert Armstrong Adkin, Hodeslea, Meads, Eastbourne (introduced by J. R. le B. Tomlin and George Shrubsole).

Late Member Deceased.

J. R. B. Masefield. A vote of condolence with the relatives was passed.

Papers Read.

"Notes on a Land Shell and Moonstone from Venezuela," by G. C. Spence.

"*Helix pomatia* L. in Sussex," by Dr. W. D. Lang, M.A., D.Sc., F.R.S.

"Notes on the occurrence of *Helix pomatia* L. in the Holocene of Sussex," by A. S. Kennard, A.L.S., F.G.S.

Exhibits.

By Mr. W. H. Davies : A fine series of *Lymnæa peregra*, *auricularia*, *stagnalis*, *Planorbis corneus*, *Physa heterostrophæ*, from Reddish Canal, shewing variation of form, sculpture and colour ; also *Helix nemoralis* from Baguley and reversed *L. peregra*.

By Mr. C. H. Moore : *Rotella japonica* and *Delphinula stellata* showing difference in outline.

The special exhibit was *H. aspersa* and varieties.

**599th Meeting, held at the Manchester Museum, in conjunction with the
Leeds Branch, April 9th, 1932.**

The President, Dr. E. W. Howell, in the chair.

The following members and friends were present :—Messrs A. K. Lawson, J. R. Dibb, K. Howell, H. J. Armstrong, C. H. Moore, G. C. Spence, R. S. Jackson, Drs. A. E. Boycott and J. W. Jackson, Mrs. Morehouse, Mrs. Howell, Mrs. Howell, Mrs. A. M. Jackson, and Miss A. S. Jackson.

New Member Elected.

R. A. Adkin.

Candidates Proposed for Membership.

U. S. Grant, 4th, Ph.D., Asst. Professor of Geology, University of California, Los Angeles, California, U.S.A. (introduced by H. Schlesch and J. W. Jackson).

Thomas W. Twiggs, 39, Sunnymead Avenue, Mitcham, Surrey (introduced by A. K. Lawson and J. W. Jackson).

Member Deceased.

Wm. Charles Blake.

Papers Read.

“John Richard Beech Masefield (1850-1932),” by Chas. Oldham, F.L.S.

“Notes on some Scottish and Shetland Pisidia,” by Chas. Oldham, F.L.S.

“Pearls in *Mytilus edulis* L.,” by J. E. Cooper.

“*Paludestrina jenkinsi* (Smith) found 500 feet above sea-level,” by R. MacDonald.

Address by the President.

The President, Dr. E. W. Howell, gave a short address on molluscan radulæ, the technique of their preparation, and their photography, illustrating his remarks by several interesting exhibits.

Exhibits.

By Dr. E. W. Howell :—Photographs of radulae, etc.

By Mr. G. C. Spence :—Various mollusca, extinct or nearly so.

By Mr. C. H. Moore :—Varieties of *Cypræa tigris* and *C. talpa*.

By Mr. H. J. Armstrong :—*Paryphanta busbyi*. from New Zealand, and *Trigonia lamarckii*, from New South Wales.

By Mr. K. Howell :—*Arion ater* var. *bicolor* (juvenile) from Bare, near Morecambe, Lancs.

By Mrs. Morehouse :—*Cyclophorus*, *Aulopoma*, etc.

The J. W. Taylor Collection of Books and Shells, lately donated to the Society by Mrs. Taylor and family, was also on exhibition.

600th Meeting, held at the Manchester Museum, May 7th, 1932.

Mr. G. C. Spence in the chair.

Additions to Library.

“On the Ecology and Control of Slugs,” by Herbert W. Miles, James Wood, and Ieuan Thomas.

“Materiais para o Estudo da Fauna dos Açores,” by Augusto Nobre.

"Moluscos Terrestres, Fluviais e das Aguas Solobras de Portugal," by Augusto Nobre.

New Members Elected.

Dr. U. S. Grant. Thomas W. Twiggs.

Candidate Proposed for Membership.

Dr. Leopoldo Faustino, Chief Geologist, Bureau of Science, Manila, Philippines (introduced by Hugh C. Fulton and J. W. Jackson).

Members Struck Off.

Two members were struck off the list.

Papers Read.

"*Isidorella pyramidata* (Sow.)," by H. E. Quick.

"Non-Marine Shell deposits in Yorkshire (N. Riding) and Durham," by A. S. Kennard, A.L.S. and B. R. Lucas, F.G.S.

Exhibits.

By Mrs. Morehouse :—Series of Pteropods.

By Mr. C. H. Moore :—*Vitrea cellaria* from Ightham Fissures, *Limnaea stagnalis* and *Sphaerium corneum* from clay deposit, West Kirby, Cheshire.

By Mr. G. C. Spence :—Series of *Achatina* spp.

ACCOUNTS FOR THE YEAR ENDED DECEMBER 31st, 1931.

Income and Expenditure Account.

RECEIPTS.			EXPENDITURE.		
	£	s. d.		£	s. d.
To Annual Subscriptions for 1931 :			By publishing and distributing <i>Journal of Conchology</i> , Vol.		
143 at 10/-	71	10 0	xix, no. 3	48	9 4
2 at 7/6	0	15 0	„ no. 4	31	10 11
24 at 5/-	6	0 0	„ no. 5	32	13 0
			(est'd),, no. 6	40	0 0
	78	5 0			152 13 3
Arrears ...	6	15 0	„ Authors' Reprints ...	11	17 9
			„ do (estd. cost)...	5	0 0
	85	0 0			169 11 0
„ Sale of Publications ...	19	14 8	Less Contributions		
„ Advertisements ...	1	9 0	by Authors ...	7	15 7
„ Transfer from Life Membership Fund ...	10	0 0	Grants from Research Fund...	11	13 4
			Provision in A/c for 1930 ...	52	10 0
					71 18 11
					97 12 1
			„ Printing and Stationery	1	2 6
			„ Warehousing Stock ..	1	10 0
			„ Fire Insurance ..	0	10 0
			„ Subscriptions :		
			Zoological Record		
			1930, 1931 ...	0	10 0
			Malac. Society		
			1930, 1931 ...	2	2 0
			Lancs. & Chesh.		
			Fauna Com'tee	0	5 0—2 17 0
			„ Officers' Expenses ...	10	2 4
			„ Balance, being excess of income over expenditure	2	9 9
					£116 3 8
					£116 3 8

Life Membership Fund.

To amount of Fund, Jan. 1st, £ s. d.	By Transfer to Income and £ s. d.
1931 288 9 2	Expenditure Account ... 10 0 0
„ One Composition Fee ... 6 6 0	„ Amount of Fund, Dec.
„ Dividends and Interest 14 6 4	31st, 1931 299 1 6
<u>£309 1 6</u>	<u>£309 1 6</u>

Research Fund.

To amount of Fund, Jan. 1st, £ s. d.	By Grants to Authors for £ s. d.
1931 213 15 1	Illustrations 11 13 4
Dividends and Interest ... 9 4 9	„ Amount of Fund ...
	December 31st, 1931 211 6 6
<u>£222 19 10</u>	<u>£222 19 10</u>

BALANCE SHEET.

<i>Liabilities.</i>	£ s. d.	<i>Assets.</i>	£ s. d.
Annual Subscriptions paid in advance 7 5 0		4% Funding Loan, £365 8 7	
Est. cost of <i>J. of C.</i> , vol. xix, no. 6, and Authors' Rep'ts 45 0 0		cost 300 0 0	
Life Membership Fund ... 299 1 6		4½% Conversion Loan, ...	
Research Fund 211 6 6		£202 13 3	
Balance of Income & Expenditure A/c		cost 200 0 0	
January 1st, 1931 9 2 6		Cash at Bankers 74 5 3	
Balance for 1931 2 9 9			
<u>11 12 3</u>			
<u>£574 5 3</u>		<u>£574 5 3</u>	

NOTE.—Assets in addition to those set out in the Balance Sheet are (a) Library; (b) Cabinets and Collections; (c) Stock of unsold Publications; (d) Annual Subscriptions in arrear.

CHAS. OLDHAM,

Audited and found correct, 31st December, 1931.

Hon. Treasurer.

C. H. MOORE, } *Auditors.*
F. TAYLOR



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and vars., *H. virgata* var. *major*, *H. hort.* vars. *arenicola*, *rufozon-*
ata, *fuscolabris*, *incarnata* + *fuscolabris*—3d. each. *Coch. acuta*
and vars., *H. cartusiana*, *C. rolpheii*, *C. laminata*, var. *albina*—2d. each.
Type and vars. of *H. pisana*, *H. virgata*, *H. caperata*, *H. itala*, *H. nem.*,
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Pisidium conventus Clessin in Caernarvonshire. —Last May I took this species in another of the Snowdonian tarns, Llyn Glas, a shallow pool with a stony bed at 1750 feet in Cwm Clogwyn, on the western side of the Snowdon massif. The *Pisidium* was fairly abundant at one spot in silt among *Littorella uniflora*—the only plant in the tarn. I found none elsewhere, and the only other mollusca seen were *Ancylus fluviatilis* and a thin-shelled form of *Limnæa pereger*. —CHAS. OLDHAM (*Read before the Society*, 7th December, 1932).

A reversed **Hygromia hispida** L. —On removing the animal of a *Helix aspersa*, which I took at West Blatchington near Brighton, from its shell a small dead shell fell off which I should have thrown away had I not fortunately noticed that it was sinistral. It was very dirty and bleached, and I thought it was a young *striolata*, but Mr. Tomlin, to whom I forwarded the specimen for his opinion, identifies it without any doubt as *hispida*. It is curious that amongst the dozens of *aspersa* abroad on a wet evening I should have carried home the one that was at the moment crawling over a sinistral shell. —A. G. STUBBS (*Read before the Society*, December 7th, 1932).

On the sub-genus Apoma Beck. —This Jamaican sub-genus of *Brachypodella* is described by Gloyne (*J. of C.* vol. 1, p. 53) as being viviparous. Pilsbry (Tryon's Manual xvi, p. 106) also mentions this and on plate 2, fig. 5, gives a drawing of "a young shell of *A. gracilis* (Wood) removed from the mother and not quite at full term." From specimens recently received of *gracilis* from Spring Mount, St. James and *chemnitziana*, Fér. from Fern Gully, St. Ann, the genus would appear to be ovoviviparous as one example of the former and two of the latter each contained an egg, that of *gracilis* being approximately $2 \times 1\frac{1}{2}$ mm. whilst those of *chemnitziana* are rather smaller. All have a thick yellowish white calcareous shell. Two appear to be "cracking-out" after which presumably the young snail continues to develop further prior to birth, at which time it is about 4 mm long. In *chemnitziana* the surface of the egg does not appear to be so smooth and polished as that of *gracilis*. It may be of interest to mention that I have in my collection a dextral individual of the normally sinistral *A. gracilis*. So far as I know this is the first record of this abnormality. —G. C. SPENCE (*Read before the Society*, 7th December, 1932).

RADULAE.

By THE REV. E. W. BOWELL, M.A., F.R.M.S., M.R.C.S., L.R.C.P.

(Presidential Address delivered at the Annual Meeting, October 8th, 1932).

COLLECTING radulae is as interesting as collecting snails. There is usually a definite difference between every sort and the allied kinds. We do not know nearly as much as we hope soon to find out about the way in which the radula is made and works: but it gives us pleasure to find out about such things. The photographs which I have brought for you to see show plainly that the radula is complicated. If we call it a fortuitous precipitate we do not understand the words, or they have some quite new meaning.

With the exception of the two large slugs (*cinereo-niger* and *maximus*) and a few of the Planorbes, which I have not sufficiently studied, I find that all the British species are distinguishable by radula, though it is true that a few have very similar radulae. With regard to the marine mollusca there is more similarity. The general facts can be seen in Troschel and Thiele's book on the subject. There it is evident that there are not nearly enough types of radulae to go round, and very many have to share nearly the same type. But they have found actual and not merely comparative differences in most of them.

Two previous presidents have tried to settle the question of the name of a certain British snail, the Shiny snail, in fact. Following my predecessors I am asked what is the proper name of the Shiny snail, and I reply that it is *Zonites glaber* Stud. (and Jeff.).

Since I most unfortunately supported one of these past presidents in his efforts to increase the number of species in the British list, I am very properly expected to say why I have changed my opinion. I have very definitely done so and have no longer any doubt at all about the matter. I am as certain as a conchologist can be that I know more about snails than I did 25 years ago. And I am as certain as a specialist in radulae can be that the three figures in my paper of 1908, supposed then by me to represent three species, do really represent one only, and that is *Z. glaber* Studer and Jeffreys. They are mere age variations of the same species. The whole of the art of examining radulae, so far as I am concerned, is subsequent to that date. Practically the whole of my knowledge of men and things has undergone a serious change since that date.

Finding differences was the great preoccupation of the older naturalists: and I am sure they ran this idea to death. To a simple minded person like myself, there is nothing so uninteresting as a long list of very nearly similar species. We should begin to pick up the

similarities. But just because of this the young radula collector should be advised not to pay much attention to what has been written on the subject. If there is one thing that I should like to put in here by way of advice it is to keep all the details you can about every specimen. When men are becoming ancient, they always have such good advice to give away gratis.

Philosophers from the time of Hippocrates the Great have been accustomed to tease naturalists upon their excessive devotion to trifles. I agree that the balance of time has by now turned against the philosophers, and yet I am strangely enough disposed to realise the truth which exists in their warnings against preoccupation with the excessively minute. I know the kind of feeling that a man has when he has drawn very fine distinctions, but I do not now think it should be confused with love of truth, on which ground it is always commended. There is phil-something else which is better after all than philomathy. The poor old philosophers of ancient times had no such instruments as we to-day can use, and consequently they could not see a great many things which we can see. But on the whole and in a wider sense they were right in their warnings against too much specialisation. Being in this matter largely a hedonist, I freely admit that in my opinion the specialist has a poor time. He suffers first from having too little to do : afterwards, when he has accumulated facts, from having too much, which nobody has taken the trouble to understand.

Had I been wise I should have run away from you and left the opinion you want to be given by someone else, more able to state facts in favour of a theory which possessed him long ago. The old English naturalists suffered from many disadvantages, and they bequeathed them to their successors. The line of action which they took upon various matters was too much influenced by the accumulations of past experience of other observers, such as J must be wrong, J must be proved wrong, and so forth. I think there is no such necessity. I object to the practice of tying living bodies to dead ones (Aen 8:485) and I am in favour of a general amnesia of Victorian notions of natural history. Personalities were too generally mixed up with them, and personalities are always a sure sign that the orator has no case, and knows it.

Now it is quite possible for any conchologist to relinquish the ways of the past and to find out for himself something new to take up : something worth doing which has not been done before. Any of these lines are useful for really original research :—

(1) Find out the best way of fixing the bodies of snails so that they are preserved for purposes of microscopic research. The fact that they

“consume away” at an unusually rapid rate, and that various spaces easily become obliterated, suggests that some much more energetic plan than the usual ones might succeed, and special attention to cytological methods will naturally be expected at the present day. The semi-human type of histology on which most of our anatomists have been brought up may require considerable alterations to make it fitting for the detailed study of such animals as these. I dare even to suggest the view that we have too long regarded snails as mere part of “comparative anatomy” and disregarded the extraordinary facts which geologists have been able to tell us about their past history. Messrs Kennard and Woodward have for many years collected information on this subject (distribution) on a large scale, so that there is really something to start with, before the whole surface of the country has been completely abraded for the advantage of motorists.

(2) Up to the present radulae have been generally studied by a method which is far from satisfactory. It is now possible to stain radulae and to mount them in canada balsam. It is also possible to photograph them with more success than formerly. Let anyone compare the tentative classification included at the end of Loven’s original paper on the subject, and thence make it clear to all “curiosi” exactly what influence this has had upon Zoological classification. The paper is unfortunately rare, but the part to which I refer is written in Latin, and easily intelligible.

With regard to the suggestions of some members that radulae are of no use in classification, I am in partial agreement with the critics. But the opinions of the American school of malacologists who were fierce “radulologists” at the period when we were deep in our mid-victorian slumbers, would be of the greatest interest. The Americans, we know, are great collectors, and they have also preserved for many years a closer connexion with scientific laboratories than we generally enjoy. The position is now that though the magnitude of Dr. Gwatkin’s work is generally realised, there is considerable doubt as to the general value of the claims made by the earlier lovers of the radulae concerning their importance in classification ; and these doubts are based upon comparatively recent work that has been done upon the substance chitin, and partially verified by workers here. The view to which we now incline is that it is a kind of precipitate of amorphous material formed in the sac at the formative end of the radula. It is difficult to think that such material can carry characters ; but in fact we know that species may be differentiated by radulae, and that a *Helix* carrying a *Zonites* radula is quite inconceivable. It certainly looks as if snails must be without genealogy. That should raise general interest in them.

Krause (Mikros. Technik, vol. i, 1926) gives various methods for softening and ultimately dissolving chitin. Some years before I had succeeded in the softening of radulae and so preparing them for permeation by suitable stains.

My process, which I showed to Col. Peile, is to blacken with dilute potassium permanganate, wash this out with weak oxalic acid, and stain with dilute aqueous solution of dahlia. This process is of course preceded by the usual caustic soda, used boiling. I show you some specimens to-day. This may be described as easy, and I think you will agree that it shows up details which are quite missed by the earlier methods.

(3) Radulae can be examined with advantage by means of water immersion objectives, and also with lenses intended for use without ocular. The peculiar advantages and disadvantages of each will be obvious. For these purposes no chemical is needed except distilled water.

(4) The times of appearance of various species, with the prevailing weather at the time, would be an interesting study for anyone who has a fairly large garden and meteorological instruments. In mine I find *Milax gracilis* for a few weeks after *sowerbyi* has been common, and then again in the autumn, of a larger size. But I did not actually find them on the same day. This kind of phaenological observation may be of interest to those who are clever at deciphering the causes of things. Probably little attention was paid to slugs before Roebuck's time. But besides these four comparatively simple matters, there are many more developments of conchology which may be commended to your attention.

Let us compare the oldest method of staining radulae with the one now proposed. Two elements of the Krause method of softening chitin are present. There is the caustic soda which by itself is insufficient; and there is the acid treatment which follows. But what acid? It is now evident that the best results come from the use of polybasic acids; and of these there is a long list available in the chemiker Kalender, with a number of data which indicate their special qualities. Some we can cut out as plainly unsuitable for other reasons. But the research has to be continued until we find a method which is absolutely perfect; and the same has to be done with the stain which is also an object of search. The present position is that oxidation with pot. permang. followed by oxalic acid is satisfactory, but the method is not completed until much more has been done. Every investigator who has the interests of knowledge at heart will be anxious to contribute to the upbuilding of this edifice, for it must be the key

of our future chemical biology of the mollusca ; a very simple matter perhaps it may seem, this finding out of the essential properties of chitin ; but to pursue it to the end needs much more work. We are now just arriving at the stage when we can see the reasons of our previous experiments. For instance we can understand why the method quoted by Mr. Taylor in the Monograph does sometimes actually succeed. We can now discern why it is that the more condensed part of the uncus, which we call the cone, is of higher refractive index, and we are able to hazard a reasonable guess as to the way in which the radula acts, and what it is for. Observation assures us that it is an extremely mobile organ ; also that each uncus is built up of many layers. The radula is continually being polished up "*non vi sed saepe movendo*," and hence it acquired those remarkable properties which we know so well ; the hardness and the high refractive index.

In a sense our investigations are centred round these two qualities, which you will readily see to be of primary importance to the life of any animal of this nature. In the old methods of staining radulae there is a little softening of the material, which indicates that a staining process is possible. This has now been made effective. And there is an optical change in the material which for many years has been detected by means of the polariscope, though the phenomenon is not sufficiently pronounced to permit its useful employment for general purposes. This effect is obliterated by oxidising processes ; does it not seem that this is yet another indication for research ? Our first object was to make the radula visible for comparative study ; most people were satisfied with the use of the temporary mounting media ; but when people learned that homogeneous media with accurate staining were far more effective in actual practice, we had to turn to methods for securing that. Meanwhile we are coming to realise the possibilities of other methods, such as water immersion system and systems for use without cover glass. Something is gained by all these methods, and something is gained by our discovering that the most beautiful drawings are no substitute for photographs. The subject has become enormously wide ; anyone who wants to write a book on it now will find that he has a great deal of work before him which has never been tackled before, and that there is no need to discuss the opinions and characters of the dead.

When we begin to study the physiology of the snail we are making a sharp transition from any otherwise known physiology. The fact of mucus and its unique properties meets us at every turn. What we should consider normal functions of organs are apparently absent, and we need to study the mucus-producing animals as a separate class of

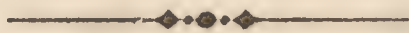
the animal kingdom, if any such crude expression is now permissible. Mucus in the higher animals is the great insulator, which for example, enables bile to be kept in the gall bladder, and facilitates all kinds of movements, especially locomotory ones.

I suggest that there is a third important use of the snail's mucus, namely the polishing of the radular teeth, without which process the teeth would probably be of little practical use. The pictures that have been published showing the tracks of various snails appear to be closely related to this subject, though I am not yet satisfied that I understand how these tongue-prints are produced. Snails with abnormal teeth (or tongues) are rare, and no one yet has experimented with Testacellae: I only know that they appear to disgorge their prey quite easily, and that evidence of the prey being poison is difficult to find, though the existence of poisoning devices has long been described. If they should be shown to have an objective existence, it would be difficult to fit them in with the precipitate theory. Then there is the theory of radula formation by means of formative cells, as described by Rucker and Roessler, which should be re-examined because of the much greater difficulties which now exist in visualising the formative process. The unci that are in process of formation in the radula sac can be seen by examining a fresh radula, they are soft, and stain easily with acid dyes, retaining this property after the remainder of the organ (?) is hardened. They are, therefore, easily observed by the old staining processes, but not in that now proposed. If it is desired to have complete counts of the radular teeth, the most recent method should be followed. Now whatever plan we use, the general appearance of the radula itself is not much altered, for the rows of mucus cells are easily hydrolysed. As this matter has interested me very much of late, I have thought it worth bringing before you in a presidential address, because it is a matter upon which we all can have opinions, and as yet there is not sufficient information available to serve as excuse for what St. Paul describes as bitterness.

The name *Oxychilus* has been employed as a subgeneric term for the forms of *Zonites* which have a radula of the type of *cellaria*; that is to say for *lucida*, *cellaria*, *alliaria* and *glabra*. These are all distinguishable by the radula alone. The name is supposed to indicate their possession of a sharp lip. But it would be far more satisfactory if it indicated the result of their possessing a sharp lip, namely, their power to continue growing after they have reached maturity; this circumstance has been the cause of all the trouble about continental *glabra*. It is known by its large size and the possession of a narrow umbilicus. This is only two ways of describing the same character.

I do not know whether it is common anywhere on the continent ; but Mr. Watson did not send me any specimen from Solothurn. The ordinary *helvetica* type still occurs there, and is identical with the English species, of which Mr. Oldham has kindly sent me specimens this morning from Cornwall. They have the characteristic blackness of the last whorl, but this is not evident in specimens which have been allowed to dry in the shell. There is no reason to doubt that *helvetica* is simply a synonym for the early stage of *Zonites glaber* Studer. The large form of *alliaria* was evidently unknown at the time when the species was described ; and forms of *cellaria* quite as large as the average *lucida* are not rare in England as well as in Ireland. If we propose to cut the matter short by saying that in consequence of their oxycheileutic tendencies size is not an important feature in these forms, which is in fact my own opinion, we shall be obliged to cut out another species from the British list.

I remember that Mr. W. Moss was entirely persuaded of the separateness of *lucida* as a species, and on grounds which were quite certainly insufficient : for any one would admit that it is far more difficult to identify a snail from its genitalia than from its radula ; provided that the right means has been taken to prepare it for the microscope. It was worth while to have this bitter controversy if only to show that it is never of any use to take your opinions from other people. You must see the things yourself, both in the field and as microscopic objects, before you advance to the position of certainty. I had intended rigidly to exclude any condemnation of the past ; but for the sake of conchology itself I will add that this seems to me to show the way to a satisfactory explanation of the multiplicity of species alleged by some authors : and the same principle will have to be carried out in all other difficult genera.



Food of Slugs.—On October 29th last, a snake was killed near a road on the outskirts of Stalybridge. Two days later the body was retrieved by a friend who invited me to inspect it. The reptile proved to be a 2ft. 6in. specimen of the Common Grass Snake, and on the body was a young *Limax maximus* apparently engaged in trying to make a meal of the dead reptile. This seems to be a case of reversal. Instead of snake eating slug, the slug was eating snake. I am indebted to Mr. C. Oldham for identifying the specimen which was only one inch in length. —C. H. MOORE (*Read before the Society, 7th December, 1932*).

DESCRIPTION OF A NEW SPECIES OF THECACERA.

By K. H. BARNARD, D.Sc., F.L.S.
(South African Museum, Cape Town).

(Read before the Society, September 10th, 1932).

THE species of the genus *Thecacera* Fleming are not numerous, and apparently all the species are rare. Three British species are recognized (O'Donoghue, Proc. Mal. Soc. xv. p. 224, 1922 and Winckworth, *J. Conch.* xix., p. 234, 1932). Cockerell (1901) described a species from California (see O'Donoghue. *l.c.* p. 139) and Eliot (*J. Conch.* xi., p. 241, 1905) described one from Karachi. Alder and Hancock (Brit. Nudibr. Moll. pt. 6, 1854) mention an undescribed species collected by Darwin in the Chonos Archipelago, south of Chiloe.

The following species was collected by myself on an iron bar suspended from the Municipal pumping jetty, Cape Town, on 26th July, 1932. The bar was sunk about 4 ft. below the low-tide level in about 3 fathoms of water, and was covered with a luxuriant growth of Tunicates, Hydroids, Polyzoa and Sponges.

Thecacera lamellata n.sp.

Length (expanded) about 20 mm. Semi-transparent white with large black spots on sides and back, not quite symmetrically arranged on the two sides; an orange spot on lateral margin of head and



Fig. 1.

another subterminally in front of the tip of the tail, which is chalky-white. Rhinophores deep orange. Lateral portion of rhinophore sheaths bright orange, with chalky-white tip, frontal and inner portion white with two black spots and a yellow-orange spot between them. Gills for the most part orange. Postbranchial appendages bright orange, with chalky-white tips and a small black subapical spot.

Shape of body as in *pennigera* (Alder and Hancock, *l.c.* pt. 7, 1855. Fam. 1, pl. 21a). Both the rhinophore sheaths and the postbranchial appendages are much larger than in *pennigera*, lamellate, subtriangular or subcircular in lateral view.

The gills, as Eliot says of *maculata*, can be counted as 3 or 5, as the lateral plumes are deeply cleft. Dermal spicules scattered, rod-like, granulate or nodulose.

Jaws as in *pennigera*. Radula formula $11 \times 2 + 2.0.2 + 2$. The first lateral tooth is not so strongly hamate as that figured for *pennigera*, and the second tooth is stouter; the third is subtriangular, tapering posteriorly, with a small notch on inner margin and no cusp; the outermost plate is small and feeble.

The species differs in the radula formula from *maculata* and the three British species. I have not seen the description of *velox* Cock., and Eliot does not mention it.

Fig. 1. *Thecacera lamellata* n.sp. Whole animal and radula teeth. The orange parts of the animal are stippled.



Crepidula fornicata L.—On July 21st, 1932, I found a specimen of *Mytilus edulis* at Hove (attached to roots of *Laminaria*) on which was living a *Crepidula fornicata*. This seems to be worth recording.—J. G. DALGLIESH (*Read before the Society*, September 10th, 1932).

VERTIGO LILLJEBORGI (West.) in GREAT BRITAIN
(with additional IRISH localities).

BY D. K. KEVAN AND A. R. WATERSTON.

EVER since its discovery in the British Isles, in 1845, *Vertigo lilljeborgi* has been looked upon as a rare and local snail, only to be found along lake margins in the West of Ireland. Until its re-discovery in 1902, in fact, its occurrence partook of the nature of a myth, and even after that date, owing to its superficial resemblance to other species of *Vertigo* and the lack of data regarding its habits, its right to a place in our fauna was, in some quarters, a matter for considerable doubt. In a paper read before the Society in February 1929, Mr. A. W. Stelfox (1)¹ summarised the history of the species in Ireland, and suggested, not only that it must have a wider distribution in Ireland, but that its occurrence in Scotland and the English Lake District was probable. This prophecy has been fulfilled. The snail has been found both in Scotland and England. The facts of the discovery are as follow.

A. On the 4th September, 1929, Waterston, who was collecting on the flooded margin of Loch Tromlee, Argyll, found Vertigos in abundance, which he regarded as *V. antivertigo*. Later they were re-labelled *V. pygmaea*, but doubt still being felt as to their identity, they were sent to Mr. R. S. Phillips in April 1931 for examination, and were identified by him as *V. lilljeborgi*. On the 24th May, 1931, Waterston visited Ardlui, Dumbartonshire, hoping to discover the species in that area, and was successful in doing so in marshes on the banks of the River Falloch. From this it appeared probable that further search would result in its being found over a much wider area, and we decided to make a camping tour of the Argyll district where it was originally found, the Dumbarton area, and, in fact, any area that the time at our disposal would permit us to explore.

On the 16th July we started out by car *via* Stirling, and during a mid-day halt by Loch Lubnaig, Perth South, were attracted by some marshy ground by its edge. We were fortunate enough to find a few *V. lilljeborgi* there, and plenty further along the loch, and, later in the day, we took it again at Loch Lairig Eala, Glen Ogle, Perth Mid. Near Ardlui, Dumbartonshire, we found it at Lochan Dubh on the 17th July, but were unsuccessful by Loch Lomond or the Geal Loch which flows into it. From the 19th to the 24th July we explored a number of lochs in various parts of Argyll (more particularly near the original locality, L. Tromlee), Perth Mid and Perth South. At nearly every loch we found *V. lilljeborgi*, in many cases in plenty or even

1 The figures in parenthesis refer to the Bibliography at the end of this paper.

abundance, and it seems likely that a more thorough search would have revealed it at most of those places where we were unsuccessful. Altogether *V. lilljeborgi* was taken in 20 localities.

Additional Irish localities were discovered by Waterston, who, collecting with Prof. A. E. Boycott and Mr. Chas. Oldham, obtained specimens on the 14th August 1931 in two places in the Killarney District, Kerry North, and also, on the 16th August, near Dunloe Castle, Kerry South.

B. Profiting by the experience gained in Argyll, Kevan next found *V. lilljeborgi* at Loughrigg Tarn and Little Langdale Tarn, Westmorland, on the 30th August. On that date Rydal Water only yielded *V. antivertigo*, but revisiting the place in the following week, he found a colony of *V. lilljeborgi* on the 5th September close to, but not in association with *V. antivertigo*. On the 6th September, he found the species at Blelham Tarn, North Lancs., and on the 7th September at Elter Water.

On the 19th September Kevan discovered *V. lilljeborgi* in the marshes at Mount Bog, near Blyth Bridge, Peeblesshire, and on the 3rd October, another Perth South locality was added by him at Loch Chon, near Aberfoyle.

Further English localities were added by him at Lowes Water and Derwent Water (Cumberland) on the 25th and 26th March 1932 respectively.

V. lilljeborgi, therefore, is now known to occur in 22 localities in Scotland, 7 in England and 3 in Ireland, in addition to those previously recorded in the last-named country (1). There seems little doubt it will be found to have an even wider range.

C. LIST OF NEW LOCALITIES.

The localities are arranged under the Comital or Vice-comital divisions as set out in the Roebuck Census (*Journ. of Conch.* vol. 16, June 1921). TABLE 1 shows the floral associates at each station and TABLE 2 the molluscan associates.

All the localities are indicated on Bartholomew's $\frac{1}{2}$ " Map with the exception of localities (5) (6) (13) and (22), and these are shown on the 6" Ordnance Survey Map of Scotland 1875 and/or 1899.

MAIN ARGYLL (KILCHRENAN DISTRICT). V.C. 98

(1) LOCH TROMLEE 379 ft.

- (a) 4/9/29. Patch of flooded ground on S.W. side. The original Scottish locality. *V. lilljeborgi* taken in large numbers in water-net. Associated flora not listed.

- (b) 19/7/31. (i) N.E. corner. *Carex* association.
 (ii) Half-way along E. side. Fairly marshy.
Juncus and *Iris* mixed.
 (iii) Three-quarters-way along E. side.
Juncus association.
 (iv) S.E. corner. Marshy. *Carex* and
Juncus association.

Generally on decaying *Juncus* and *Carex*, but not so plentiful as in station (a).

(2) KILCHRENAN BURN 378 ft.

19/7/31 Left bank of stream flowing from L. Tromlee, near the loch. Bed of *Deschampsia* and *Juncus*. Sparsely distributed on decaying vegetation.

(3) DUBH LOCH 380 ft.

19/7/31 Two stations: N. and E. sides of loch. *Juncus* association. *V. lilljeborgi* fairly common on rotting *Juncus*.

(4) LOCH NA GEALAICH 380 ft. app.

22/7/31 *Juncus* association. *V. lilljeborgi* found sparingly around margins of loch, feeding on decaying *Carex*.

V. substriata, curiously enough, occurred close to water's edge under decaying cast-up *Arundo* stems, but there was no sign of *V. lilljeborgi* in association.

(5) LOCHAN CARRAIGEACH 660 ft. app.

20/7/31 West end of loch. *Carex* association. One specimen found amongst decaying *Carex*.

(6) LOCHAN NA SGUABAICH 657 ft. app.

20/7/31 *V. lilljeborgi* found (i) along the stony margin of the loch, under drifted *Arundo* stems and *Pteris aquilina* pinnæ, this *locus* being the one most similar to its "typical" Irish habitat, and (ii) in a *Carex* association—a single specimen being taken in a bed of *Carex*, *Sphagnum*, etc., very peaty, and much choked up with mosses.

(7) LOCH NANT 607 ft.

20/7/31 East Bank of loch. *Carex* association. A single specimen was found after a long search, the bases of the plants being choked up with *Sphagnum*.

(8) LOCH IASGAICH 631 ft. app.

20/7/31 S.E. corner. *Carex* association. A prolonged search only yielded a single immature specimen. The general nature of the ground was very peaty.

MAIN ARGYLL (KILMELFORT DISTRICT). V.C.98

(9) LOCH NAN DRUINNEAN 170 ft.

22/7/31 Marshy ground at North end of loch. Mixed plant association. It was a wet day and *Vertigos* were active, and crawling on the green vegetation. *V. lilljeborgi* and *V. anti-vertigo* (not associated) were mostly on *Juncus* and *Carex*, while *V. substriata* preferred *Iris* and *Spiræa* farther back from the edge of the loch.

(10) LOCH AVICH 311 ft.

22/7/31 West end of loch. Extensive marshes.

(a) Close to edge of loch. A few *V. lilljeborgi* found on rotting *Carex*, while some were ascending green stems of *Juncus*. Mixed plant association.

(b) A very wet fenced-off marsh, about 400 yards from (a). *Arundo* and *Deschampsia* dominant. *V. lilljeborgi* were here found in plenty on prostrate and decaying stems of *Arundo* and leaves of *Deschampsia*.

MAIN ARGYLL (TYNDRUM DISTRICT). V.C. 98

(11) LOCHAN BHITH (Bhé) 822 ft.

23/7/31 West end of loch. Marshy ground. *Carex* association. The marsh was covered by 8" of flood-water, and *V. lilljeborgi* was taken in plenty by "sieving" amongst the herbage (cp. L. Tromlee 4/9/29). Other specimens were found in the less flooded portions of the marsh, crawling on *Carex*.

DUMBARTONSHIRE (ARDLUI DISTRICT). V.C.99

(12) RIVER FALLOCH 27 ft. app.

18/5/31 Marshes on left bank of river, about half-mile from Geal Loch. Mixed plant association. A few *V. lilljeborgi* found under old alder branches, and a log.

(13) LOCHAN DUBH 304 ft.

17/7/31 *Arundo* association. *V. lilljeborgi* found sparingly on prostrate decaying stems of *Arundo* round the swampy margin of the loch.

PERTH MID. (CRIANLARICH DISTRICT). V.C.88

(14) LOCH DOCHART 512 ft.

23/7/31 Flooded bank at West end of loch. *Carex* association. The locus was under 12" of flood-water, only a few *V. lilljeborgi* being taken with water-net and sieve (cp. L. Tromlee 4/9/29 and Lochan Bhith 23/7/31). Associated mollusca all submerged.

PERTH MID. (KILLIN DISTRICT). V.C.88

(15) LOCH TAY 355 ft.

23/7/31 South bank of loch about $1\frac{3}{4}$ miles from Killin. *V. lilljeborgi* was found in plenty, crawling on decaying oak, beech and alder leaves and on decaying *Juncus*, in a bed of *Juncus*, overhung by the trees named. All specimens well-grown.

(16) LOCH LAIRIG EALA 948 ft.

16/7/31 East shore. Mixed plant association. Several *V. lilljeborgi* found under a prostrate fencing post, and also one specimen under decaying stems of *Arundo* cast up on the bank. Highest station met with.

PERTH SOUTH (STRATHYRE DISTRICT). V.C.87

(17) LOCH VOIL 414 ft.

24/7/31 (a) On North shore, about $1\frac{1}{2}$ miles from Balquhiddar. *Juncus* association. *V. lilljeborgi* very scarce here, only one adult and one immature specimen being found.

(b) East end of loch. *Arundo* dominant. Vegetation at this station was luxuriant, and about 4 ft. high on the average. *V. lilljeborgi* was not common, but was found crawling on *Carex*, and one specimen on a rotting leaf of *Spiraea*.

(18) STRATHYRE 420 ft. app.

24/7/31 Marshy pool between R. Balvag and the Railway line, about $\frac{1}{8}$ -mile above Strathyre. *Carex* association. One large specimen found in a clump of *Carex* on border of pool.

(19) LOCH LUBNAIG 405 ft.

16/7/31 (a) About 2 miles from South end of loch. Patch of marshy ground on East bank. *Juncus-Carex* association. A few *V. lilljeborgi* were taken by tearing up handfuls of *Carex* and *Juncus* and searching amongst their bases where the snails were crawling on the decaying leaves of *Carex*. *V. substriata* was present at this station, but higher up the bank, and not in association with *V. lilljeborgi*.

(b) Head of loch. Marshy ground on East bank. *Juncus* association. *V. lilljeborgi* abundant under driftwood, logs, etc., and crawling on decaying and sometimes fresh, *Juncus*.

PERTH SOUTH (TROSSACHS). V.C.87

(20) LOCH ACHRAY 276 ft.

24/7/31 Marsh at East end. *Carex* association. *V. lilljeborgi* not uncommon on decaying *Carex*, and also under fallen wood. Juveniles abundant.

PERTH SOUTH (ABERFOYLE DISTRICT). V.C.87

(21) LOCH CHON 290 ft.

3/10/31 Marshy patch of ground, S.E. end of loch. *Juncus* association. *V. lilljeborgi* found very sparsely on decaying *Juncus*.

PEEBLES (N.W. DISTRICT). V.C.78

(22) MOUNT BOG (NEAR KIKURD) 849 ft. app.

19/9/31 Marshes on East side of the main Moffat road, about $2\frac{1}{2}$ miles past Blyth Bridge. *Carex* association. *V. lilljeborgi* sparingly distributed on decaying *Carex* and *Juncus* close to "drains" near the road.

WESTMORLAND, WITH LANCS. N. (AMBLESIDE DISTRICT).
V.C.69

(23) LOUGHRIGG TARN 308 ft.

30/8/31 A narrow marshy band at North end, to the East of small wood, close to water's edge. Mixed plant association. *V. lilljeborgi* found very sparingly on decaying *Juncus*, *Carex*, and *Spiraea* leaves.

(24) LITTLE LANGDALE TARN 340 ft.

30/8/31 Extensive marshes on North side of tarn, mostly choked with mosses. *Carex* association.

A few *V. lilljeborgi* found, by a small ditch running westwards, on decaying *Carex*, in a patch fairly free from moss.

(25) RYDAL WATER 181 ft.

5/9/31

About half-way along North side, in marshy area close to main road. *Carex* association. *V. lilljeborgi* fairly plentiful on decaying *Carex*, separated by a band of *Arundo* from a mixed plant association (*Juncus*, *Carex*, *Spiræa*, etc.) nearer the road, where *V. antivertigo* had been taken on 30/8/31, the two species being in distinct colonies.

(26) ELTER WATER 187 ft.

7/9/31

N.W. corner of lake, a small marshy patch shaded by trees. Mixed plant association. *V. lilljeborgi* sparse and difficult to find, crawling on decaying vegetation. The lake possesses fairly extensive marshy areas around its edges, but in many places the *Carex* etc. does not appear to be sufficiently dense to form a suitable habitat.

(27) BLELHAM TARN 138 ft.

6/9/31

Near Hawkshead (Lancs. N.). Marshes at South end of Tarn. *Juncus-Carex* association. *V. lilljeborgi* abundant on decaying *Juncus* and *Carex*, about half the number taken being half to three-quarters grown.

CUMBERLAND (LOWESWATER DISTRICT). V.C.70

(28) LOWES WATER 407 ft.

25/3/32

East end of lake. Marshes generally too "dirty" and the plant association too "open," consisting chiefly of *Carex spp.*, but in some decaying *Juncus* where the growth was closer, two adult and two juvenile specimens were taken after a hard search. Owing to lack of growth in March it was impossible to obtain complete list of associated plants.

CUMBERLAND (KESWICK DISTRICT). V.C.70

(29) DERWENT WATER 244 ft.

26/3/32

Marshes near Friars Crag, Keswick. *V. lilljeborgi* in abundance on decaying *Juncus* and *Carex* (preferably *Juncus*), and on interspersed dead leaves of oak, elm, sycamore,

etc. blown from a wood about a quarter-mile away. Full list of associated plants impossible owing to lack of growth in March.

KERRY NORTH (KILLARNEY DISTRICT). V.C.148N

(30) RIVER FLESK 75 ft.

14/8/31 Marshes on the right bank of the river near its mouth. *Juncus* association. *V. lilljeborgi* not uncommon crawling on decaying vegetation.

(31) ROSS CASTLE 75 ft.

14/8/31 Swampy field near the Castle. An unusual plant association—*Iris* and *Sparganium*. One specimen discovered, after a day's collecting, amongst some *V. antivertigo*. From experience in other localities, it is very doubtful if the two species were actually associated in the field, as the area explored was a wide one, but in this instance, unfortunately, it is impossible to make a definite statement on this point.

KERRY SOUTH (DUNLOE DISTRICT). V.C.148S

(32) RIVER LAUNE 70 ft.

16/8/31 Peaty marshes on the left bank of the river near Dunloe Castle. *Juncus* association. *V. lilljeborgi* rare, about 200/250 yards from a colony of *V. antivertigo*.

D. HABITAT, HABITS, ETC.

The chief fact emerging from a study of the foregoing list is that *V. lilljeborgi* is primarily and preferably a marsh-loving snail. Since its discovery by Jeffreys in 1845 "under stones by the side of a small lake at Ballinahinch near Roundstone, Co. Galway," it has—not unnaturally—been assumed that it could only be looked for with prospects of success in localities similar to that where it was originally found. Phillips (2) states that the favourite, if not the only habitat, in Ireland at least, is among the decaying roots and stems of aquatic plants cast up on lake shores, while Stelfox (5) writes "Its normal habitat is the lake shores at drift level, and all the lakes I have taken it at have rather bleak, stony margins." Now we took a certain number on decaying vegetation cast up along the margins of some of the Scottish lakes, but in the light of wider experience, it is impossible to view such occurrences as anything but adventitious, and the discovery of the species in Kerry N. and Kerry S. in habitats similar to the Scottish and English ones undoubtedly supports this view. Westerlund writes of this species (3):

“Förekommer: på sjöstränder, fästad på undre sidan af gärdslen brädlappar o. dyl. hvilka ligga på mycket våta ställen, på multnande säfstrån, och stundom djupt nedkrupen i dyn.”¹

This would seem to imply the presence of marshy land, and although Stelfox mentions (1) that R. A. Phillips found the species in May, 1909 living in a layer of decaying reeds and rushes on the broad marshy margin of a small lake near Ballinahinch Lake, Co. Galway, the “rarity” of *V. lilljeborgi* can undoubtedly be attributed, partly to the inaccessibility of the Irish localities to the majority of collectors, and partly to the emphasis that has been placed on the description of the original habitat. That the snail might have other preferences has been overlooked.

In the Scottish, English and Irish localities under review, we have found that marshy ground is an essential, and that the marshy margins of lakes and rivers provide the characteristic habitat of the species. Its stronghold appears to be in wild and mountainous or hilly country, such as is found in the Scottish Highlands, the Moorfoot Hills (Peebles), The English Lake District, Galway, Kerry, etc., and in those areas it may be found at any altitude ranging from about sea-level to over 900 feet. The land adjacent may be cultivated or semi-cultivated (e.g. Loughrigg Tarn, Westmorland) but so long as its habitat remains in its natural condition, *V. lilljeborgi* seems able to survive and thrive.

The marshes, furthermore, are characterised by certain *genera* of plants (Table 1) in which a dominance of rushes (*Juncus*), sedges (*Carex*) or reed (*Arundo*) is essential to produce the layers of decaying vegetation upon which the snail feeds. The Tufted Hair-grass (*Deschampsia cespitosa*), on occasion, also provides a suitable habitat and it may be found crawling on the damp, decaying, under-hanging leaves on the sides of the hassocks which this grass forms (L. Avich [b]). The “*Juncus* association,” to which allusion has been made in the List of Localities, consists mainly of beds of *Juncus* “*communis*,”² with Buckbean (*Menyanthes*), Cinquefoil (*Potentilla palustris*), Meadow-sweet (*Spiræa*) and other less-important marsh plants (see Table 1). This association, often rich in specimens, occurs at any altitude up to just over 400 feet. The *Carex* association has a tall sedge (*Carex*), eighteen inches to two feet high, of the *ampullacea* type as the dominant plant, with Cinquefoil, Buckbean and some-

¹ Translation: “It occurs on the margins of lakes, hidden under the edges of fencing-board (and the like) which lie in a very wet situation; on the rotting stalks of rushes, and sometimes crawling low down in the mud.”

² We have not distinguished between *J. effusus* and *J. conglomeratus* in these notes. The two species appear to grade into one another, and we find it simpler to regard them as one species.

times Gale (*Myrica*) and *Sphagnum*, especially above 600 feet. There is nearly always moss of some sort present in this association which makes searching difficult, and specimens are never so plentiful in this habitat. This association, moreover, appears to take the place of the preceding one at higher altitudes (i.e. from 400-850 feet) being most common in the Argyll area above 600 feet.

We consider that the presence of peat is not in itself a deterrent to *V. lilljeborgi* (in the R. Laune locality, for example, peats were lying stacked within 100 yards of the locality, and the fact that the flora included *Hypericum elodes* is sufficient indication of the acid content of the soil) nor is the theory of the encroachment of peat necessary to explain the nature of the original Irish habitat. The gradual drying of marshy ground would drive the species to the damper situations around the margins of the lakes, where they would be able to survive and sometimes establish strong colonies, but the mere fact that these margins happen to be stony or that the surround is peaty is merely incidental, and, to our mind of little importance. The same thing would doubtless occur in any situation where the marshes slowly dried and became unsuitable as a habitat for the species.

The conversion of numerous lochs into reservoirs has doubtless destroyed many habitats, and we have explored many reservoirs in the Lothians and Stirlingshire without success. It would seem that the rapid rise and fall of the water-level plays havoc with the food supply. Fouling by cattle, also (observed at Loch Doine—flowing into Loch Voil near Balquhiddy), may turn an apparently good locality into a hopeless stank, yielding only some of the more tenacious species such as *Agr. lævis* and *Lim. truncatula*.

V. lilljeborgi lives on the wet and rotting vegetation at the bottom, with a decided preference for *thick* layers of *Juncus* and *Carex*, from which (with *Arundo* and *Deschampsia* where they occur) it appears to derive its chief food supply. We emphasise the word "thick" as it seems to avoid situations where the *Juncus* and *Carex* are sparse. The underside of logs and branches lying in the marshes, but not sunk deeply in the mud, is also a favourite hiding place, but absolutely rotten and sodden wood is disliked. It may sometimes be found crawling after rain on growing rushes, etc., and may also be found in that situation when its habitat—as is sometimes the case—becomes flooded. It appears to be able to stand a lengthy submergence, and in temporarily flooded localities (vide L. Tromlee, Lochan Bhith and L. Dochart) can be sieved from the water, together with its land and freshwater molluscan associates. The chief clues to look for when searching for *V. lilljeborgi*, therefore, are :

- (1) A wet—not merely damp—situation in marshy ground.
- (2) A suitable plant association, providing thick layers of *Juncus*, etc. at the bottom.

A further guide to the discovery of *V. lilljeborgi* may be found in the associated Mollusca (Table 2). From the Table it will be seen that the chief associates are

Agriolimax lævis
Carychium minimum
Euconulus fulvus
Punctum pygmæum
Succinea pfeifferi
Zonitoides nitidus
Limnæa truncatula
Limnæa palustris

in the order named, the occurrence of the other snails depending largely on the proximity of the *locus* to the lake or river margin, and on the degree of saturation present—a factor varying with changing weather conditions. It may be noted that, excluding *Pisidium personatum*, all the L. Inagh associates mentioned by Stelfox (1) appear in the above list. Both this species and *Pisidium casertanum* frequently occur in the marshes inhabited by *V. lilljeborgi* but they can hardly be considered true associates, and are not included in Table 2.

As remarked by Stelfox (1) *V. lilljeborgi* does not appear to associate directly with other species of *Vertigo*. At Rydal Water, the colony of *V. lilljeborgi* was separated from *V. antivertigo* by a band of *Arundo phragmites*, the latter species occupying what, at first sight—judging by the somewhat fuller plant association—appeared to be the more favourable situation. It might be mentioned here that at Loch Droighinn (Kilchrenan District, Argyll)—not included in our Tables—where no *V. lilljeborgi* were located, a single *V. antivertigo* was found on decaying *Arundo* stems thrown up along the margin of the lake. This was the only place (apart from L. nan Druinnean, Kilmelfort District, Argyll—closer to sea-level) where this species was encountered on our Scottish tour, while in Ireland *V. antivertigo* frequently appears in the same area. *V. substriata*, often present in *Juncus*, etc. near lake margins, is usually on higher ground—a “damp” as opposed to a “wet” situation—and while, exceptionally, it may be found in a *lilljeborgi* habitat (L. na Gealaich), we saw no signs of direct association with *V. lilljeborgi*. *V. pygmæa*—rarely in Scotland, and frequently in Ireland—to be found associated with *V. antivertigo* and/or *V. substriata*, was not seen at all in the marshy localities explored when searching for *lilljeborgi*. While, therefore, it is imposs-

ible to state with certainty that no other species of *Vertigo* ever associates with *V. lilljeborgi* or that colonies (more particularly of *V. antivertigo*, to the habits of which those of *V. lilljeborgi* bear greatest resemblance) may never overlap or intermingle, the presence of other *Vertigos* in an apparently favourable habitat can be taken as a sign that *V. lilljeborgi* is not so likely to be found in that precise situation, although it may well be present in an adjacent part of the marsh.

A further point to be noted is that *V. lilljeborgi* and its chief associates (excluding *Succinea pfeifferi*) can stand a lengthy submergence in areas temporarily flooded (L. Tromlee, Lochan Bhith, L. Dochart). The only species of this group in which this ability has, so far, not been fully recognised is *Punctum pygmæum*. *S. pfeifferi*, however, in order to survive must be able to crawl up the vegetation above water, and it is probable that the species avoids areas which are subject to prolonged flooding. It is significant that, at the three stations where *V. lilljeborgi* was sieved or netted from flood-water, *Succinea* is absent from the list of associates.

Casual occurrences of *Limnæa pereger* juv. were noticed (L. Lubnaig (a) and Strathyre) but the wandering habits of this species being well known, it cannot be considered as a regular associate and is not included in Table (2). One specimen of *Lauria cylindracea* was unaccountably found in association with *V. lilljeborgi* at Loch Avich(a). This species is also excluded from Table 2, its occurrence in this situation being entirely abnormal. *Arion circumscriptus* was also noted on one occasion in association with *V. lilljeborgi* (marshy bank of R. Flesk, Kerry, N.), and *Planorbis spirorbis* at Derwent Water, Cumberland.

The breeding habits of *V. lilljeborgi* are virtually unknown, but it would seem that breeding takes place during the months of June and July, since specimens collected in Dumbarton in May were all mature, while juveniles were frequently met with in both Scotland and England in July, August and September.

E. METHODS OF COLLECTION.

In collecting *V. lilljeborgi* the following methods were employed:

- (1) Lying prostrate in the marshes, and patiently searching the decaying vegetation.
- (2) Where plants were very thick, tearing up handfuls of *Juncus* etc. and examining the sheathing leaf bases.
- (3) Sieving and netting—in flooded areas.
- (4) Filling bags with moss and rotting vegetation for examination at leisure, but this method is hardly likely to be productive unless the presence of *V. lilljeborgi* is first ascertained by methods (1) or (2).

For the sake of comparison, we consider it a matter of considerable importance that a complete list of the associated *flora* and *mollusca* should be made at each new locality where *V. lilljeborgi* may be found, and the *dominant* plants should be noted, and we commend this to the notice of collectors who may seek to extend its range. We anticipate that it will be found to be much more widely distributed in Scotland and Ireland, and the possibility of its discovery in Wales and other suitable areas in England should not be overlooked.

F. THE SHELL.

In the specimens collected in the new localities considerable variation occurs, both in shape and size, from a short "squat" form with the body-whorl much swollen and quasi-conical in appearance, to a tall sturdy form, more spindle-shaped when fully grown. Although shells at each locality frequently develop a characteristic form, both extremes (and many intermediate varieties) may be found living together, and the younger specimens of the sturdy type have much the appearance of the fully grown "squat" type, the difference, however, being immediately evident on examination of the aperture, wherein the state of development of the denticles is sufficient to reveal maturity or otherwise. In Scotland, the short "squat" form is the more common.

The number and strength of the denticles is also subject to variation. Westerlund states in his *Exposé Critique* 1871 [Ref. K. & W. Synonymy (4)]:

"4-5 dentata; dente parietali 1 (interdum cum adjacenti anteriori secundo punctiformi), dentibus columellaribus 2, inferiore minimo, saepe defecto; palatalibus 2, altis, brevissimis, longe a peristomate remotis."

Both this, and Pilsbry's description—*vide* Ellis (5)—while recognising the frequent absence of the lower columellar denticle, emphasise that the five-toothed form is more normal, whereas Ellis himself states that the shell has normally four apertural folds or denticles. Now that a good range of shells has been obtained, it is perhaps possible to throw some light on the question of the normal form.

From examination of all the specimens obtained in the 32 new localities with which this paper deals, we can give the following percentages:

- (a) The four-toothed form - about 85%
- (b) The five-toothed form - „ 15%

The extra punctiform parietal denticle appears to be only of rare occurrence and was only noted in 1%. While, without an equal number of shells from each locality, figures are apt to be deceptive, it

seems very evident that the four-toothed variety is by far the more usual, although nearly pure colonies of the five-toothed variety may occasionally be found (Loch Tay), and we agree with Ellis (5) that the former can be considered the normal form.

As to the identification of *V. lilljeborgi*, it has, in the past, been mistaken for *V. moulinsiana*, *V. antivertigo* and for a swollen form of *V. pygmæa*. Phillips (2) summarises the difference between *V. lilljeborgi* and *V. moulinsiana*, and contrasts the former with *V. genesii* (6) but comparison with *V. pygmæa* has not been so fully made. Ellis (5) states that the aperture is more "squarose" [i.e. squarish] than in *V. pygmæa*, and to this we would add that the shell is considerably larger, and much glossier; its whorls more swollen and suture correspondingly deeper; colour, definitely a strong horn colour, and not possessing the chestnut tint of *V. pygmæa*; more striate in the line of growth, and having only a slight tendency to constriction in the outer lip. Owing to size and similarity of habitat, however, *V. lilljeborgi* is apt to be confused with *V. antivertigo* (and, when searching for *V. lilljeborgi*, we might add *vice versa*), but examination of the aperture will quickly differentiate the two. In *antivertigo* there is a very well-marked constriction in the outer lip; the denticles (including at least 2, and frequently 3 parietals) are not less than six, more usually eight, and may be as many as ten in number, and are very much stronger—particularly the palatals, which are distinctly flange-like; the colour is deep (purplish) brown, and the shell, although glossy, is less transparent and only faintly striated; moreover, the whorls are less ventricose, suture shallower, and the general form more evenly barrel-shaped. The main characteristics of *V. lilljeborgi*, therefore, are its size, tumidity, colour, texture and dentition, and failing the finding of fully grown individuals, one or other of these characteristics should assist in its correct identification.

We are indebted to Mr. R. A. Phillips for examining all our shells, to Mr. J. R. le B. Tomlin for references, and to Mr. Chas. Oldham for his advice on the preparation of this paper.

SUMMARY.

- A. The discovery of *V. lilljeborgi*, and subsequent extension of its range in SCOTLAND.
- B. The discovery of *Vertigo lilljeborgi* in ENGLAND.
- C. List of new localities.
- D. Habitat, habits, etc. Marshy ground essential in wild, and mountainous or hilly country, characterised by certain genera of plants (Table 1) in which a dominance of rushes, sedges

and reed, etc. is necessary to produce the layers of decaying vegetation upon which the species feeds. Associated *mollusca* a further guide in searching for *V. lilljeborgi* (Table 2). No instance of *direct* association with other species of *Vertigo* noted, although frequently in proximity. Can stand a lengthy submergence in areas temporarily flooded.

- E. Methods of collection. The strong probability of the range of *V. lilljeborgi* being widely extended in Scotland and Ireland and the possibility of its discovery in Wales and other suitable areas in England.
- F. The shell. The two chief forms. The four-toothed variety the more common. The identification of *V. lilljeborgi* and its comparison with other species of the same *genus*.

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- (6) Stelfox, A. W. & Phillips, R. A., Journ. of Conch., Vol. 17, pp. 236-40, figs. 1-5, 1925.



TABLE 2			MOLLUSCA																			TOTAL SPECIES	
LOCALITY			CENSUS AREA	ALTITUDE IN FEET	<i>C. minimum</i>	<i>L. truncatula</i>	<i>L. palustris</i>	<i>Pl. contortus</i>	<i>S. pfeifferi</i> *	<i>V. antiverigo</i>	<i>V. substriata</i>	<i>V. liljeborgi</i>	<i>Col. edentula</i>	<i>Coch. lubrica</i>	<i>P. pygmaeum</i>	<i>Arion ater</i>	<i>A. intermedius</i>	<i>Euc. fulvus</i>	<i>Z. nitidus</i>	<i>Ret. radiatula</i>	<i>Agr. laevis</i>	<i>Agr. agrestis</i>	
SCOTLAND																							
Loch Tromlee (a) ...	98	379			o	o	o					||			o						o		6
„ „ (b i) ...	98	379										o							x				2
„ „ (b ii)...	98	379	x	x								x			x			o					5
„ „ (b iii)	98	379	x									x			x			x			x		5
„ „ (b iv)	98	379										x									x		2
Kilchrenan Burn ...	98	378						o				o							x				3
Dubh Loch ...	98	380	x		o							o			x			x	x		o		7
L. na Gealaich ...	98	380	x					x		÷	x				x						x		6
L. Carraigeach ...	98	660	x									x			x								3
L. na Sguabaich ...	98	657	x	x								x											3
Loch Nant ...	98	607				x						x									x		3
Loch Iasgaich ...	98	631	x									x											2
L. nan Druinnean ...	98	170	x	x						÷	÷	x	x		x	x		x			x	x	11
Loch Avich (a) ...	98	311	x					x				o			x			x			x		6
„ „ (b) ...	98	311	x					x				||			x			x	x		o		7
Lochan Bhith ...	98	822	x	x								||									o		4
River Falloch ...	99	27	o	x								x						x	x		x		6
Lochan Dubh ...	99	304			o	o	x					o											4
Loch Dochart ...	88	512				x						x			o				x		o		5
Loch Tay ...	88	355	o	x								||					x	x	x	o			7
L. Lairig Eala ...	88	948	x									x		x				x	x				5
Loch Voil (a) ...	87	414										x						x				x	3
„ „ (b) ...	87	414	x	x								x				x		x			x	x	7
Strathyre ...	87	420						÷				x			x						x		4
Loch Lubnaig (a) ...	87	405	x							÷		o				x				x	x		6
„ „ (b) ...	87	405	o	x				o				||		x	x	x		o	o	x	x		11
Loch Achray ...	87	276			x							||			x						x		4
Loch Chon ...	87	290	o	x								x			x		x	x			o		7
Mount Bog ...	78	849				o		÷				o			x			x			x		6
ENGLAND																							
Loughrigg Tarn ...	69	308				x		x				x						x	x		x		6
Lit. Langdale Tarn ...	69	340				x		x				x											3
Rydal Water ...	69	181	÷		o		÷	÷				o			÷		÷	÷			x		9
Elter Water ..	69	187	x		x	x		x				x			x			x	x				7
Blelham Tarn ...	69	138	o		o	x						||			x			x	o	x	o		9
Lowes Water ...	70	407	x	x				x				x			x		x	x		x	x		9
Derwent Water ...	70	244				o		x				||			x			x	x		o		7
IRELAND																							
River Flesk ...	148N	75	x	x				x				o						x	x		x		7
Ross Castle ...	148N	75	x		x					÷	÷	x			x			x			x		8
River Laune ...	148S	70	x	x						÷	÷	x			x	x		o	x		o	x	11
TOTAL OCCURRENCES ...					25	14	13	2	17	4	4	39	1	2	22	6	5	23	14	4	27	4	

* Includes *S. putris*, frequently present.

TABLE 1.				CENSUS AREA	ALTITUDE IN FEET	F L O R A															
|| Dominant × Interspersed + Occasional						<i>Ranunculus flammula</i>	<i>Caltha palustris</i>	<i>Cardamine pratensis</i>	<i>Lycnis flos-cuculi</i>	<i>Stellaria graminea</i>	<i>Hypericum elodes</i>	<i>Lotus uliginosus</i>	<i>Spirea ulmaria</i>	<i>Potentilla tormentilla</i>	<i>P. anserina</i>	<i>P. palustris</i>	<i>Sanguisorba officinalis</i>	<i>Epilobium palustre</i>	<i>Lythrum salicaria</i>	<i>Parnassia palustris</i>	<i>Hydrocotyle vulgaris</i>
LOCALITY																					
SCOTLAND						NOT NOTED															
Loch Tromlee (a)	...	...	98	379																
„ „ (b i)	...	...	98	379																
„ „ (b ii)	...	...	98	379																
„ „ (b iii)	...	...	98	379																
„ „ (b iv)	...	...	98	379																
Kilchrenan Burn	...	...	98	378																
Dubh Loch	...	...	98	380											×				×	
L. na Gealaich	...	...	98	380	×							×								×
L. Carraigeach	...	...	98	660											×					
L. na Sguabaich	...	...	98	657																
Loch Nant	...	...	98	607	×															×
Loch Iasgaich	...	...	98	631	×															
L. nan Druinnean	...	...	98	170	×	×		×			×			×					×	×
Loch Avich (a)	...	...	98	311	×	×		×							×					
„ „ (b)	...	...	98	311				×			×				×					
Lochan Bhith	...	...	98	822	×	×		×							×					
River Falloch	...	...	99	27	×	×	+				×	×		×	×			+		×
Lochan Dubh	...	...	99	304	×										×					×
Loch Dochart	...	...	88	512	×	×						×	×		×					
Loch Tay...	...	...	88	355																
L. Lairig Eala	...	...	88	948									×							
L. Voil (a)	...	...	87	414	×	×		×	+		×				×		+			
„ (b)	...	...	87	414		×						×								
Strathyre	...	...	87	420																
L. Lubnaig (a)	...	...	87	405								×								
„ (b)	...	...	87	405	×	×		×												×
Loch Achray	...	...	87	276	×	×									×					×
Loch Chon	..	...	87	290							×				×		+			×
Mount Bog	..	...	78	849	×	×	+						×							×
ENGLAND																					
Loughrigg Tarn	...	...	69	308									×							
Lit. Langdale Tarn	...	...	69	340									×					+		
Rydal Water	...	...	69	181																
Elter Water	...	...	69	187									×							
Blelham Tarn	..	...	69	138								×	×			+		×		
Lowes Water	...	...	70	407																
Derwent Water	..	...	70	244									×							×
IRELAND																					
River Flesk	...	...	148N	75											×					×
Ross Castle	...	...	148N	75	×								×		×					
River Laune	...	...	148S	70	×					+		×		×				×		
TOTAL OCCURRENCES					15	10	2	6	1	1	4	14	3	1	15	1	2	4	2	11	

FLORA (Contd.)

Angelica sylvestris
Galium palustre
Valeriana officinalis
Scabiosa succisa
Achillea ptarmica
Senecio aquaticus
Erica cinerea
Menyanthes trifoliata
Myosotis palustris
Rhinanthus minor
Pedicularis palustris
Mentha aquatica
Prunella vulgaris
Scutellaria galericulata
Ajuga reptans
Rumex sp.
Myrica gale
Alnus glutinosa
Sparganium sp.
Orchis purpurella
Iris pseudacorus
Juncus "communis"
Eleocharis sp.
Eriophorum sp.
Carex "ampullacea"
Carex spp.
Deschampsia cespitosa
Arundo phragmites
Holcus sp.
Selaginella selaginoides
Equisetum limosum
Sphagnum spp.
Musci spp.
Hepaticæ

(Vide List of Localities)

TOTAL SPECIES

4
4
3
5
3
3
8
8
8
6
6
4
15
15
8
9
24
9
12
1
4
13
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2
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8
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4
7
18

4 15 3 1 3 4 2 18 3 1 4 9 5 2 1 2 6 5 2 1 5 32 4 3 15 20 5 8 7 1 2 6 14 1

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN & IRELAND.

601st Meeting, held at the Manchester Museum, September 10th, 1932.

Mr. G. C. Spence in the chair.

New Member Elected.

Dr. Leopoldo Faustino.

Papers Read.

"*Crepidula fornicata* on *Mytilus edulis*," by J. G. Dalgliesh.

"Description of a new species of the genus *Thecacera* (Nudibranchiata)," by K. H. Barnard, D.Sc.

"Note on the Colouration of *Nucella lapillus* (L.)," by E. St. John Burton.

"A new dwarf race in Cypræidæ: *Erronea* (*Blasicrura*) *kieneri depriesteri* nov. subsp.," by Dr. F. A. Schilder.

"A visit to Loch Skene in search of *Lymnæa burnetti*," by A. K. Lawson.

Exhibits.

By Dr. J. W. Jackson (for Mr. H. Searle): Living *Arion ater* (L.) var. *castanea*, from Middleton, near Manchester; (for Mr. A. E. Holmes Smith) living specimen of *Limax maximus* (L.) var. *fasciatus*, from allotments in Salford; (for Mr. J. F. M. de Bartolomé) a subscalariform specimen of *Helicigona lapicida*, from Marlborough, Wilts.

By Mr. A. K. Lawson: *Lymnæa burnetti* from Loch Skene, and photograph of the locality.

By Mr. C. H. Moore: Light-coloured and carinate forms of *Paludestrina ienkinsi*, from Droylsden; large *Hydrobia ulvæ*, from Southport; and *Phytia myosotis*, from Longton, near Preston (coll. W. H. Heathcote).

By Mr. G. C. Spence: *Streptostele* spp.

602nd (Annual) Meeting, held in the rooms of The Royal Society, Burlington House, London, on Saturday, October 8th, 1932.

The President, Dr. E. W. Bowell, in the chair.

Amongst those present were Messrs. J. G. Dalgliesh, J. R. le B. Tomlin, A. G. Stubbs, R. Garnett, A. E. Salisbury, G. L. Wilkins, T. W. Twiggs, J. D. Dean, H. C. Fulton, J. V. Dacie, A. P. Gardiner, J. E. Cooper, W. J. Davey, H. McClelland, G. Shrubsole, F. M. Dyke, A. E. Ellis, Dr. J. W. Jackson, Capt. C. Diver, Capt. H. E. Quick, Major M. Connolly, Lt.-Col. A. J. Peile, Mrs. Morehouse, Miss K. M. White, Miss J. D. Robertson, Mr. and Mrs. R. Winckworth, Mr. and Mrs. A. S. Kennard, Mr. and Mrs. H. Overton, Mr. and Mrs. G. C. Spence, Mr. and Mrs. A. Wrigley, Dr. and Mrs. John H. Boycott, Professor and Mrs. A. E. Boycott.

Appointment of Scrutineers.

Mr. H. Overton and Dr. H. E. Quick were appointed Scrutineers.

Appointment of Auditors.

Messrs. C. H. Moore and F. Taylor were appointed Auditors.

Member Deceased.

C. W. Johnson.

Presidential Address.

The President (Dr. E. W. Bowell) gave an address on "*Radulæ*" and a cordial vote of thanks was passed unanimously.

Votes of thanks were also accorded to the Authorities of the Royal Society and the Manchester Museum for the use of rooms for meetings of the Society, and to The Linnean Society for the use of microscopes.

Election of Officers and Council.

The Officers and Council for 1932-33 were unanimously elected as nominated (see page 285).

Exhibits.

By Dr. J. W. Jackson: Living *Arion ater* (L.) (several colour varieties) from Middleton, near Manchester (on behalf of Mr. H. Searle).

By Mr. H. W. Worsfold: *Nerita polita* (colour variations); Shell-sections; Shells showing abnormalities and colour alterations caused by accident.

By Capt. H. E. Quick: *Isidorella pyramidata* (Sow.) (living); *Ampullaria* sp. (living); and a large *Physa* sp. from a garden pond at Swansea.

By Mr. A. S. Kennard: *Helicodonta obvoluta* (Müll.) from Flint Mines, Easton Down, S. Wilts; Baudon's "Monograph of Succineas of France" with original drawings by the author.

By Mr. G. L. Wilkins: Growth-stages of *Strombus*, *Pterocera*, *Vermetus* and *Cypræa*.

By Mr. D. K. Kevan: *Lymnæa pereger* (Müll.) from marsh at Gullane, with monstrous specimen resembling a *Valvata*.

By Prof. A. E. Boycott: *Lymnæa involuta* Harvey collected young in Lough Crincaum, Killarney, August, 1931, and bred up in aquaria.

By Mr. C. Oldham and Prof. A. E. Boycott: *Lymnæa pereger* (Müll.) from mountain lakes in Inverness and Merioneth.

By Mr. J. D. Dean: Clausilium of Clausiliids, mainly Asiatic *Phædusa*.

By Lt.-Col. A. J. Peile: Colour vars. of *Helicina* sp. from St. Kitts.

By Mr. J. Gordon Dalglish: Japanese Brachiopoda and Pectens.

By Mr. A. E. Salisbury: *Helix aspersa* Müll., monst. from the garden of the Rev. J. B. Glass, Barrington, Somerset.

By Mr. R. Winckworth: Living *Lepton squamosum* (Mont.) (adults and fry) with the commensal *Gebia* from Salcombe; also photograph of the habitat: *Achatina fulica* Fér., from Colombo; series of eggs, young and adult shells.

By Mr. J. E. Cooper: Jenyns' "Pisidia" with author's handwriting and T. V. Wollaston's book-plate; Baudon's "Pisidies Françaises" with his autograph; Pearls, pearl-formation and "blisters" of *Mytilus edulis*, from Swalecliffe, E. Kent, 1932. One shell of *M. edulis* contained 93 pearls.

By Mr. A. G. Stubbs: Exceptionally large *H. virgata*, *caperata*, *heripensis* and *cantiana*; also *H. aspersa* vars., *H. obvoluta*, *H. cartusiana*, *C. acuta* vars., *H. lucida*, etc. from Sussex. Also fine drawings of Land, Freshwater and Marine shells.

By Mr. H. Overton: A large and very fine series of mollusca from Wicken Fen, Cambridge, May, 1932.

By Mrs. Morehouse: *Helix hortensis* Müll., from Bramham, Leeds; *Planorbis spirorbis* (L.) from Almholme, Doncaster.

By Capt. C. Diver: Items from the exhibit "Mollusca Genetics" shown at the Sixth International Congress of Genetics, in August 1932, at Ithaca, N.Y., U.S.A. The items included variation, genetics, and population studies in (a) *Helix aspersa* (Boycott, Diver, Oldham, Stelfox and Watson); (b) *H. nemoralis* and *hortensis* (Aubertin, Boycott, Diver, Lang and Stelfox).

By Mr. A. P. Gardiner : Nudibranchs from Devon and Cornwall ; soft parts of *Galeomma turtoni* Sow. from Jersey ; *Acanthochitona crinitus* Penn., *A. discrepans* Brown and *A. communis* Risso ; association of animals found under stones of which the lower ends are bedded in the substratum (Jersey), including *Rissoa albella* Loven, *Galeodina carinata* da C., *Tornus* and *Lepidopleurus scabridus* Jeff.

By Mr. J. R. le B. Tomlin : A series of *Rhiostoma* including *R. asiphon* Mllff., *R. spelæotes* Tomlin, *R. samuiensis* Tomlin, *R. jalorensis* Sykes, and *R. jousseumei* Morgan ; a white example of *Cypræa hesitata* Iredale ; rare S. African deepwater species, including *Neptuneopsis gilchristi* Sow., *Latirus mosselensis* Tomlin, *Glypteuthria capensis* Tomlin, *Charitodoron* (n.g.) *aglaia*, *thalia*, *euphrosyne*, all of Tomlin.

ANNUAL REPORT.

This is the Fifty-Sixth Annual Report of the Society. During the last twelve months the Society has lost three members by death, three by resignation, and two have been struck off the list under Rule IV. Four have been elected during the year. The present membership is 238, including the four Honorary Members.

The losses by death are C. W. Johnson, W. C. Blake and J. R. B. Masefield. An obituary of the last is now in the press and will appear in the forthcoming Journal.

Six ordinary meetings have been held at the Manchester Museum by kind permission of the authorities. On November 14th there was a joint meeting with the Leeds Branch at Leeds when many exhibits were made and Mr. Fred Taylor gave an interesting talk on a large series of non-marine shells from his collection. On April 9th a special meeting was held at Manchester with the President, Dr. E. W. Bowell, in the chair. There was a very good attendance, including members from a distance.

The Special Exhibits of the year have been *Helix aspersa* and varieties, *Lymnæa truncatula* and *L. palustris*.

During three months last winter the Hon. Secretary was engaged on special work in Egypt at the invitation of the Egypt Exploration Society and while there identified many shells discovered in the excavations made in the desert near Armant, Upper Egypt. In his absence, Mr. C. H. Moore, the Hon. Librarian, acted as deputy.

Two numbers of the Journal have appeared since the date of the last Annual Meeting, viz. vol. 19, no. 6, December 1931 containing 32 pages of text with text-figures and two plates (including a portrait of the late J. W. Taylor) ; vol. 19, no. 7, June 1932—a double-number with 64 pages of text, one plate, and many text-figures. The latter contains a new and revised list of the Marine Mollusca by Mr. R. Winckworth, copies of which may be purchased at a small cost from the Headquarters of the Society. The above Journals were received from the publishers by post as follows :—no. 6, 29-12-31, and no. 7, 4-7-32.

Twenty-five papers and notes have been read during the year and most of these have been published already.

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Meetings are held, by kind permission, in the apartments of the LINNEAN SOCIETY, BURLINGTON HOUSE, W.1, on the *Second Friday* in each month from *October* to *June*.

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THE BRITISH MARINE MOLLUSCA

By R. WINCKWORTH, M.A.

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JUNE, 1933.

No. 10.

THE MOLLUSCA OF CHISLET MARSHES.

By J. E. COOPER.

THE term Chislet Marshes is used here in a wide sense. It includes all the marshland lying between the sea on the north and the Sarre Wall on the south, and between Minnis Bay on the east and Reculver on the west. These marshes are $3\frac{1}{2}$ miles long and the width varies from $3\frac{1}{2}$ to $1\frac{1}{2}$ miles. The whole area is roughly 8 square miles. All this land was covered by the sea within comparatively recent years. It is this that makes a study of its present molluscan fauna of special interest.

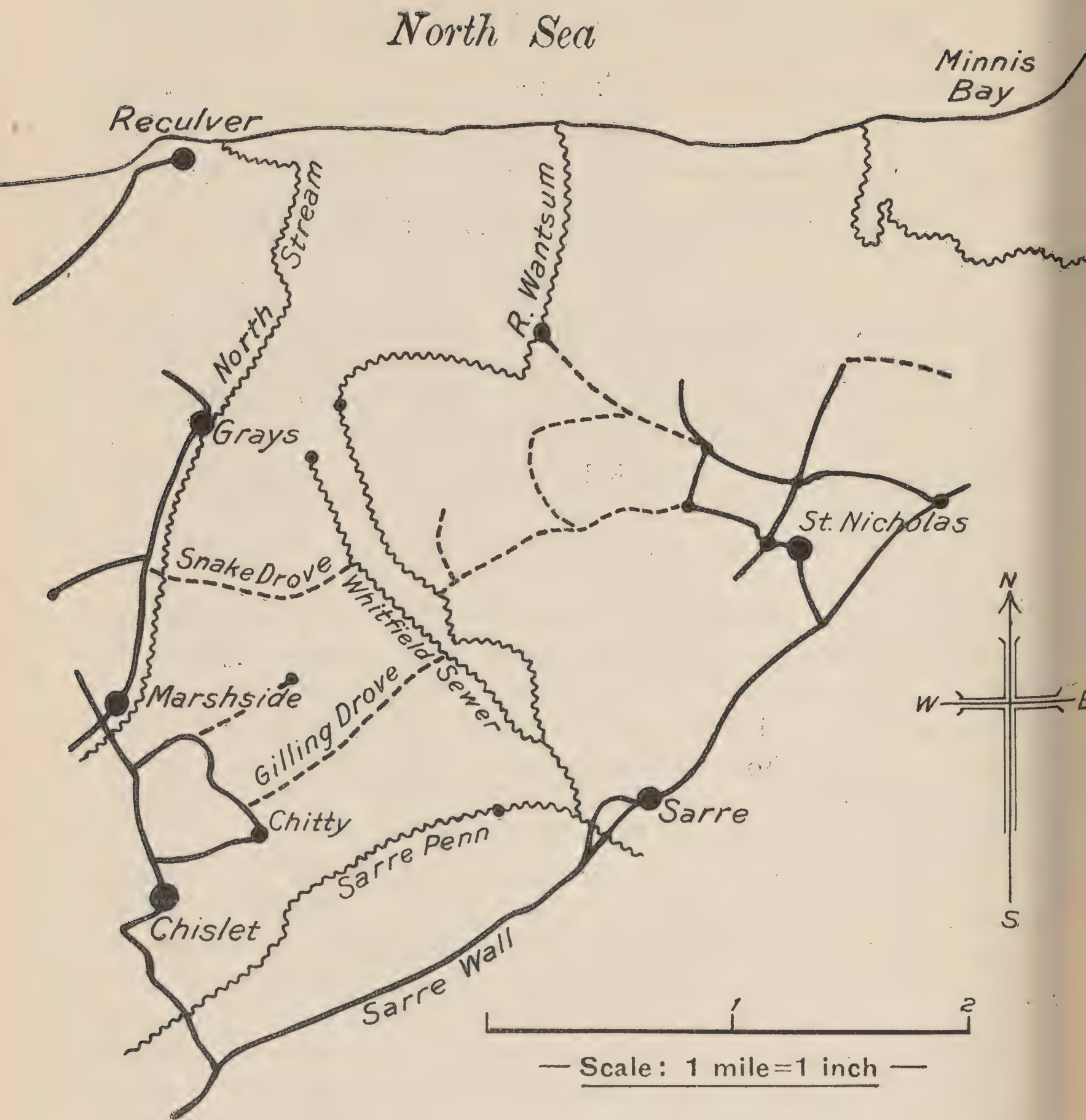
When the Romans landed in Kent in B.C. 54 Thanet was really an island divided from the mainland by an arm of the sea. The south-east outlet extended from Ramsgate to Walmer (about 8 miles); between Sarre and Chislet the sea was $1\frac{1}{2}$ miles wide; the northern outlet stretched from Reculver to Minnis Bay some $3\frac{1}{2}$ miles across. In those days and for many years after ships always used this channel. Later on it came to be known as the Wantsum Sea.

It is on record that Godwin and Harold sailed through the Wantsum Sea in A.D. 1052. Up to A.D. 1460 navigation continued for barges and small vessels, but the channel gradually silted up. Some time in the 16th century the Sarre Wall was built, which cut off the flow of the tides. The effect of this was that the currents formed a bank of shingle at or near the present coast-line. It seems to have begun at the Minnis Bay end and to have crept slowly westward. This made it possible to build Chambers Wall (date uncertain), an earthwork starting at the hamlet of Bartletts, a mile north-west of St. Nicholas, to the coast-line and thence eastward to Minnis Bay; thus reclaiming the north-east portion of the marshes.

At the end of the 18th century a double "wall" was built from Reculver to join Chambers Wall (a distance of two miles); this finally closed the Wantsum Sea.

This short sketch shows how long Chislet Marshes have been dry land. A fair estimate would be 140 to 150 years.¹ We do not know

¹ This figure only applies to the northern area. Since the above was written, I have seen some old maps of East Kent. Though they do not afford any exact data, it is practically certain that the southern part of the marshes was reclaimed long before the sea-wall was built. This would enable mollusca already established in that area to spread readily northward as soon as conditions became favourable.



Sketch Map of Chislet Marshes

Roads ————— *Cart Tracks* - - - - -

Streams & large drains } ~~~~~

Villages & hamlets } •

however how long it took to convert the "salts" into pasture-land. A large part is several feet below ordinary high-water mark, and there is some percolation of salt-water through the base of the sea-wall. Consequently the ditches nearest to the sea are brackish, and the two main streams—the river Wantsum and the North Stream—are affected for more than a mile from their outlets. The marshes are intersected by a whole network of ditches. Of these the two largest are the Sarre Penn, running across the southern end; and the Whitfield Sewer, which is nearly parallel to the Wantsum.

The streams and large drains are cleared of weeds at least once every year; this naturally discourages molluscs. The smaller ditches are more prolific. The margins of the ditches are often trampled into a morass by cattle. When this occurs land mollusca are wiped out. This accounts for the uneven distribution of *Hygromia hispida*.

The interesting question arises—how and when did the present molluscan population of Chislet marshes get there? We know that the sea was finally shut out some 140 years ago, but the marshes would remain salt for many years after.

The marshes are very largely self-contained. There are only three inlets which would be likely to bring in fresh-water species. They are the river Wantsum, which connects with the extensive Stour area south of the Sarre Wall by means of a sluice at Sarre, and one big drain a mile west of the Wantsum which also pierces the Sarre Wall. As the Stour watershed was largely reclaimed long before our marshes, it is a fair inference that most of the species came by the above routes. The third inlet is the stream running down the shallow valley southwest of Chislet; it connects with the Sarre Penn. The upper part of this stream has but few species at present.

Water-fowl no doubt have helped to introduce and distribute the aquatic molluscs. The *Helices* probably spread along the sea-wall from both east and west; but it is difficult to account for the presence of *H. virgata* and its allies along the Whitfield Sewer. This colony, though isolated, extends for about half a mile.

It should be noted that Thanet (on the east) is a mass of chalk, while the western boundary of the marshes is largely soft Thanet sand.

The present writer has noted 55 species of mollusca in these marshes and on the sea-wall which protects them from the North Sea.

Agriolimax agrestis (L.) In all parts, but not plentiful.

A. lævis (Müll.) Extends from the southern end as far as Little Grays, $1\frac{1}{2}$ miles from the sea.

Vitrea crystallina (Müll.) By ditches at Grays and Little Grays, not common.

- Hyalinia cellaria* (Müll.) Occurs here and there over the whole area.
- H. nitidula* (Drap.) A few at Little Grays.
- H. radiatula* (Ald.) A few by one ditch at Little Grays.
- Zonitoides nitidus* (Müll.) Abundant everywhere.
- Euconulus fulvus* (Müll.) Only seen at Chitty.
- Arion ater* (L.) Along the Whitfield Sewer.
- A. intermedius* Normand. Here and there from Chitty to Reculver, seems to be scarce.
- Goniodiscus rotundatus* (Müll.) Occurs at Chitty and Grays, uncommon.
- Helicella virgata* (Da Costa). In profusion on the sea-wall. A small form is plentiful on some of the higher banks in the marsh itself, particularly the one that runs along the Whitfield Sewer.
- H. caperata* (Mont.) Abundant on the sea-wall half-a-mile from Reculver, and along the Whitfield Sewer (with *H. virgata*); sparingly along the inner sea-wall.
- H. gigaxii* (Pfr.) With the previous species along the Whitfield Sewer, not seen elsewhere.
- Theba cantiana* (Mont.) Abundant in the same localities as *H. virgata*.
- Hygromia hispida* (L.) Fairly common on the margin of ditches where they have not been trampled down by cattle.
- Vallonia excentrica* Sterki. By the North Stream at Grays, and at Reculver.
- V. costata* (Müll.) With the last at Reculver, not seen elsewhere.
- Helix aspersa* Müll. Common on parts of the sea-wall.
- H. nemoralis* L. A colony on the sea-wall. (It is common at Reculver just off the marsh).
- Cochlicopa lubrica* (Müll.) Sparingly distributed from the southern boundary as far as Grays.
- Pupilla muscorum* (L.) A few at Reculver.
- Succinea putris* (L.) Fine examples along the Whitfield Sewer, also seen at Grays and near Coldharbour sluice; not at all common.
- S. pfeifferi* Rossm. Very common, especially near the sea.
- S. elegans* Risso. The form which I take to be true *elegans* is widely distributed, but is not nearly so common as the last species. It favours the more inland parts of the marsh.
- Carychium minimum* Müll. Near Chitty and at Grays. Possibly occurs elsewhere as it is easily overlooked.
- Phytia myosotis* (Drap.) A small form in the salt-pan at Reculver.
- Ancylus lacustris* (L.) In a ditch off Gilling Drove, and in another about half-a-mile from the sea.
- Lymnæa pereger* (Müll.) Very common, even in brackish ditches with the common shrimp.

L. palustris (Müll.) With the last everywhere, usually small, large examples occur at times in the smaller ditches.

f. albida Nelson. This beautiful form is found very sparingly in the Whitfield Sewer.

L. stagnalis (L.) Very common, but not found in brackish water.

Myxas glutinosa (Müll.) Locally abundant in a few ditches by Gilling Drove.

Planorbis corneus (L.) Common everywhere.

f. albina Moq. With the type in the Whitfield Sewer and a few ditches near it.

P. carinatus Müll. In some of the Gilling Drove ditches.

P. umbilicatus Müll. Very common everywhere.

P. vortex (L.) As common as the last.

P. fontanus (Lightf.) Ditches near Reculver and in a few other localities, not common.

Segmentina nitida (Müll.) Abundant at the southern end of the marsh, found sparingly in some ditches near the centre.

Physa fontinalis (L.) Common everywhere.

Aplexa hypnorum (L.) In a swamp and a few of the near-by ditches by the Sarre Penn.

Hydrobia ventrosa (Mont.) In the salt-pan at Reculver.

H. jenkinsi (Smith) In ditches and streams near the sea, extending a mile or more inland.

Bithynia tentaculata (L.) Everywhere.

B. leachii (Shepp.) Quite as common as the last.

Valvata piscinalis (Müll.) In the upper part of the Wantsum and in the Whitfield Sewer.

V. cristata Müll. Common and widely distributed.

Anodonta cygnea (L.) One dead shell in the Whitfield Sewer, careful search failed to produce more. The marsh-men however say that it lives in the Wantsum. Odd valves are found in the river mud.

Sphærium corneum (L.) Common everywhere.

S. lacustre (Müll.) Very common, even in the brackish ditches.

Pisidium nitidum Jenyns. Fairly common over the whole area.

P. milium Held. Rather more plentiful than the last.

P. pulchellum Jenyns. A solitary specimen in a ditch by Gilling Drove.

P. subtruncatum Malm. A few with the last.

P. obtusale (Lam.) Widely distributed and abundant in some spots.

P. amnicum (Müll.) River Wantsum, very scarce.

The dates and historical facts quoted above are taken from a lecture by the late Dr. W. S. H. Briand and from Mr. Donald Maxwell's book "A Detective in Kent."

Modern place names are used in all cases.

Mr. C. Oldham with his wonted kindness has identified the *Pisidia*.

ISIDORELLA PYRAMIDATA (Sow.).

BY DR. H. E. QUICK.

(Read before the Society, May 7th, 1932).

THESE Australian Planorbidae resemble the red albino *Planorbis corneus* (Linn.), the vessels and sinuses being filled with red blood.

The shell is about 20 m.m. long, sinistral, light horn colour, and rather like that of *Bullinus hypnorum*. The snails breed freely in an aquarium at 70° F., but there is a high infantile mortality. They browse on the film of green algæ and infusorians coating the glass, and curiously enough eat lettuce leaves freely. Sometimes they will feed on a dead snail or earthworm.

Fertilisation is not simultaneously mutual (fig. 1). In an instance observed on March 12th, the male partner was carried on the lip of the female partner which remained still at times and at others crawled and browsed on the glass of the aquarium. A bulky organ was evaginated from behind the left tentacle, three or four millimetres long. Then from the apex of this a much thinner structure protruded and entered the female orifice of the other snail. Coitus occupied about two hours. Subsequent dissection showed that the bulky part was the penis sheath, and the thinner one the penis ending in a brown claw as described hereafter.



Fig. 1.

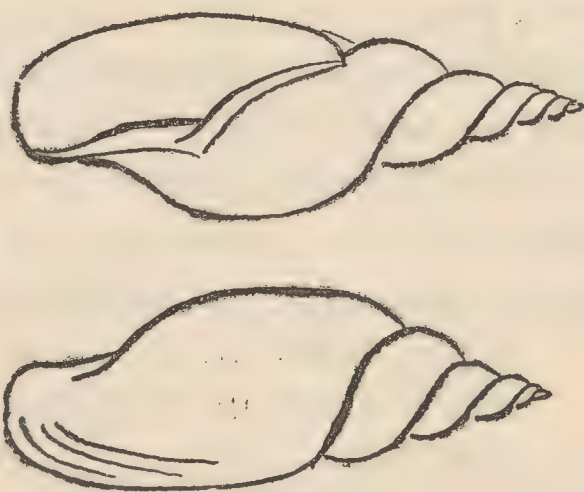


Fig. 7.

On March 27th, an exactly similar procedure was noted in another pair. The female partner was isolated and on March 29th the first capsule of eggs was laid, containing 23 eggs. The complete brood was as follows:

DATE	CAPSULES	EGGS
29-3-32	1	23
31-3-32	4	12, 14, 18, 28
4-4-32	5	6, 14, 17, 23, 24
TOTAL	10	179

*The eggs were nearly all fertile. The young emerge in from twelve to twenty days.

The gelatinous capsules (fig. 2) are invariably bent into a close U-shape forming a nearly circular mass about a centimetre across.

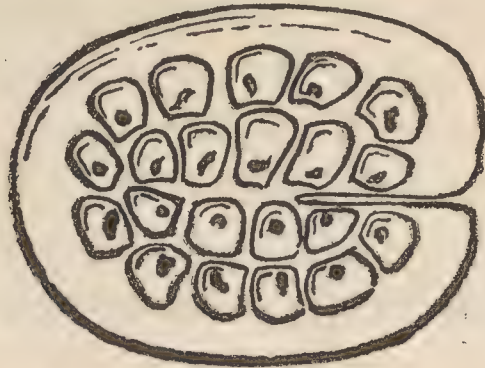


Fig. 2.

At first the young are colourless, but begin to show red in a week. They are full grown in three or four months. The young shells show no sculpture or periostracal ornamentation (cf. *Plan. corneus*). They measure 0.9 m.m. in length. Under a two-thirds objective the blunt ciliated tentacles, colourless eyes, the heart and nephridium are easily seen. In a few days the ciliated mantle lobe is a conspicuous feature and gizzard and intestine show through the shell (fig. 3).



Fig. 3.

In the newly hatched snail the curved jaw is 0.07 m.m. across with eleven striations and crenulated margin. Thin side pieces are present as in *Planorbis* (fig. 4).

The radula presents a bicuspid central tooth, five tri-cuspid laterals, and five pectinate marginals (fig. 5). The cusps are relatively shorter compared with the basal plate than in the adult radula, and the individual teeth as well as being fewer are much smaller. It is often said that embryonic organs are smaller than adult, not because the individual cells are smaller, but because they are fewer. This is not the case with the formative cell of a radular tooth.

* Dissection of this snail on April 5th showed that male as well as female organs were fully developed.

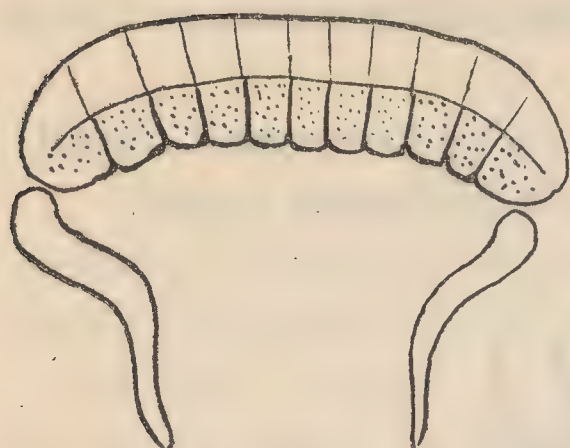


Fig. 4.

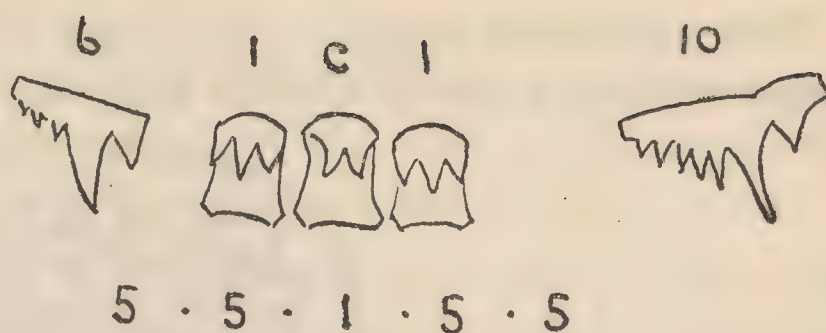


Fig. 5.

The adult jaw is dark brown, 1 m.m. across, with the usual *Planorbis* side pieces.

The radula is 2.8 m.m. by 1.2 m.m., with a bicuspid central tooth, thirteen tri-cuspid laterals, and twenty-five pectinate marginals (fig. 6). In a half grown example the formula was one central, ten lateral and ten marginals. At the marginals the transverse rows curve backwards.

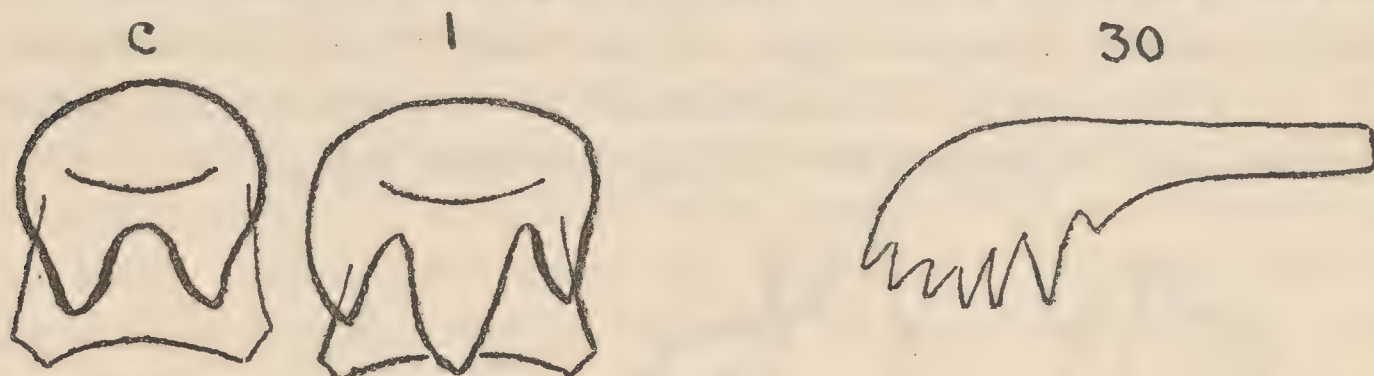


Fig. 6.

The adult snail has a sinistral shell of six rapidly increasing whorls and is about 20 m.m. long. The periphery of the upper whorls is evenly convex but that of the body whorl somewhat flattened. The mouth is inversely pear shaped, the outer lip thin and slightly convex in the line of growth. The inner and columellar lips are thin and whitish. The axis of the columella is not a straight line, but an open spiral, so that the axis of the spire is slightly inclined to the axis of the body whorl. The apex is smooth and shining and bluntly pointed. The shell is thin, translucent, horn coloured, with sometimes a tinge of green, finely striated in the line of growth. It has a silky lustre (fig. 7).

EXTERNAL FEATURES.

The body is orange red and in general resembles that of *Planorbis corneus* (Linn.). The tentacles are horizontally flattened at the base and subulate afterwards, with colourless eyes at their inner bases. The male orifice can be seen just behind the left tentacle and the female orifice about three millimetres further back.

Through the translucent shell the curved ribbon-like yellow nephridium can be seen sweeping from right to left with the convexity of the curve backwards, and a red vessel bordering each margin. The

terminal part of the ureter is bent sharply backwards. The heart is seen beating and the rectum when loaded. The white gizzard and dark intestine often show through the shell of the penultimate whorl.

A curious vascular lobulated frill protrudes just in front of the angle of the mouth of the shell (fig. 8 Fn). This arises partly from the thickened junction of the pulmonary sac with the dorsum, which carries a large blood-vessel, and partly from the floor of the sac as it leaves the dorsum on the left side. It sweeps upwards and backwards and is tethered to the mantle by a thin strand of tissue a millimetre or two from the angle of the mouth of the shell. The anus (A) opens on the posterior lobule of the frill. Two lobules of the frill when turgid during life touch the mantle of the outer lip and define two orifices leading indirectly to the pulmonary sac. Further forwards and partly hidden by these lobes a short spout-like siphon, open above and in front, leads directly to the pulmonary sac. The renal papilla opens on the dorsal side of the origin of the siphon. The frill is very mobile and richly vascular.

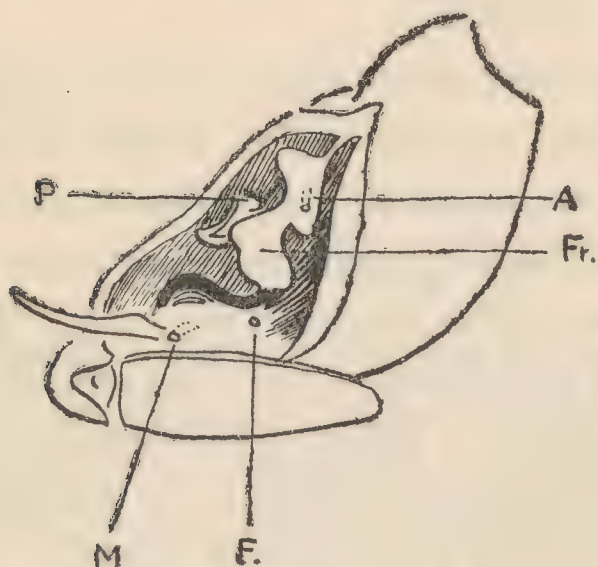


Fig. 8.

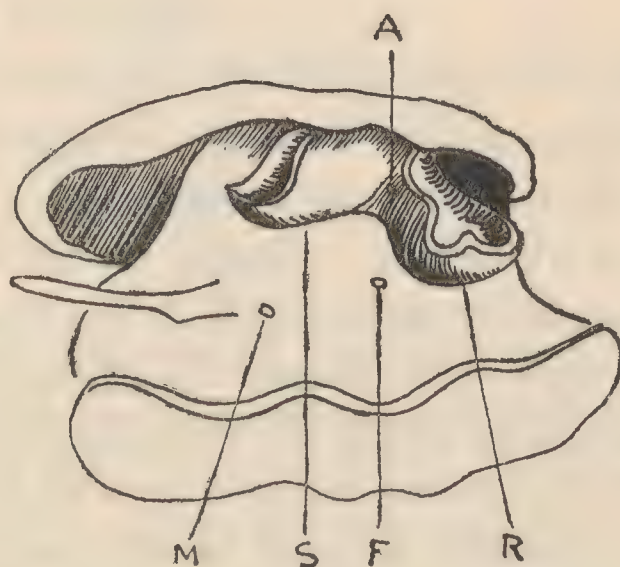


Fig. 9.

The arrangement in *Planorbis corneus* differs in some ways. The anteriorly placed siphon and its relation to the renal papilla is the same, but there is nothing corresponding to the lobes that in *Isidorella pyramidata* hide it from view; and *posteriorly* to the anus at A (fig. 9) is the vascular lobe that, when expanded in life, resembles an inverted fleur-de-lys petal. In *I. pyramidata* there is no lobe posterior to the anus.

PALLIAL ORGANS.

The auricle at the back of the pallial cavity receives vessels from the frill via the vessel at the junction of sac and dorsum, and also from the mantle.

The ribbon-shaped nephridium curves upwards to the left and then forwards and downwards and continues as the ureter to the anterior end of the sac (fig. 11). The ureter then turns sharply back to the

left and ends on a small papilla on the dorsum of the siphon at its origin just as in *Planorbis*.

The rectum opens on the posterior lobule of the frill.

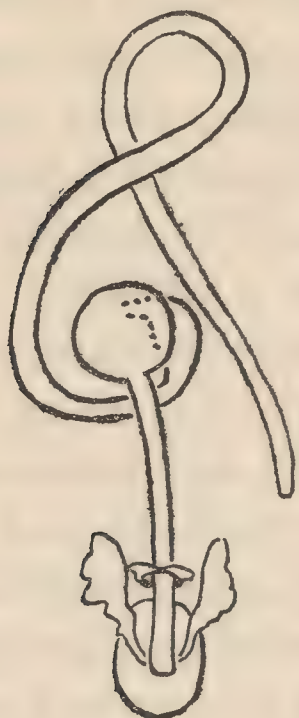


Fig. 10.

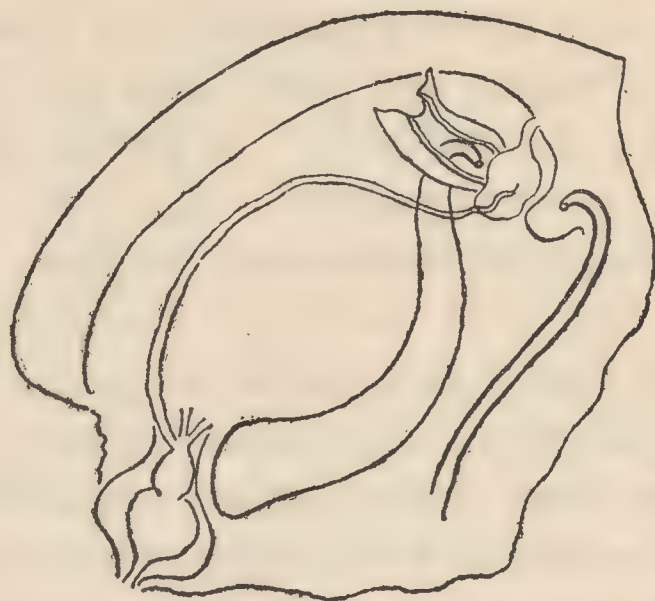


Fig. 11.

ALIMENTARY SYSTEM.

The jaw and radula have already been described. The straight oesophagus arises from the bright pink buccal bulb, which is not retractile through the nerve ring. Two small yellow salivary glands, flat and triangular in shape, lie on the buccal bulb and open into the oesophagus by short ducts at its entrance into the bulb (fig. 10). This agrees with the condition in *Planorbis* and differs from *Lymnæa* where the glands lie along the oesophagus and their ducts pass through the nerve ring in the usual way. The oesophagus leads to a glistening white spherical gizzard at the base of the penultimate whorl. The stomach arises from the back of the gizzard beneath and the intestine curves forward and then backwards to the higher whorls. The rectum runs forwards and then to the left to end on the posterior lobe of the frill as described. The liver is greenish-brown and yellow.

REPRODUCTIVE SYSTEM.

The bulky pink gonad is triangularly rounded, with its lower surface moulded on the convexity of the gizzard in the penultimate whorl, as in *Planorbis corneus*. It is not embedded in the liver. Its duct separates into two almost at once. A thin-walled duct with yellow tissue in its walls runs to a voluminous orange coloured oviduct capped by a brownish albumen gland. The oviduct narrows below to a thin-walled vagina. A short distance above its termination the spermatheca duct, which is thicker, arises and passes backwards to a globular, white, glistening spermatheca lying behind the bulky part of the oviduct (figs. 12, 13). In fig. 12 the genitalia are rotated

outwards, while the animal faces the observer, so the vas is still on the observer's left.

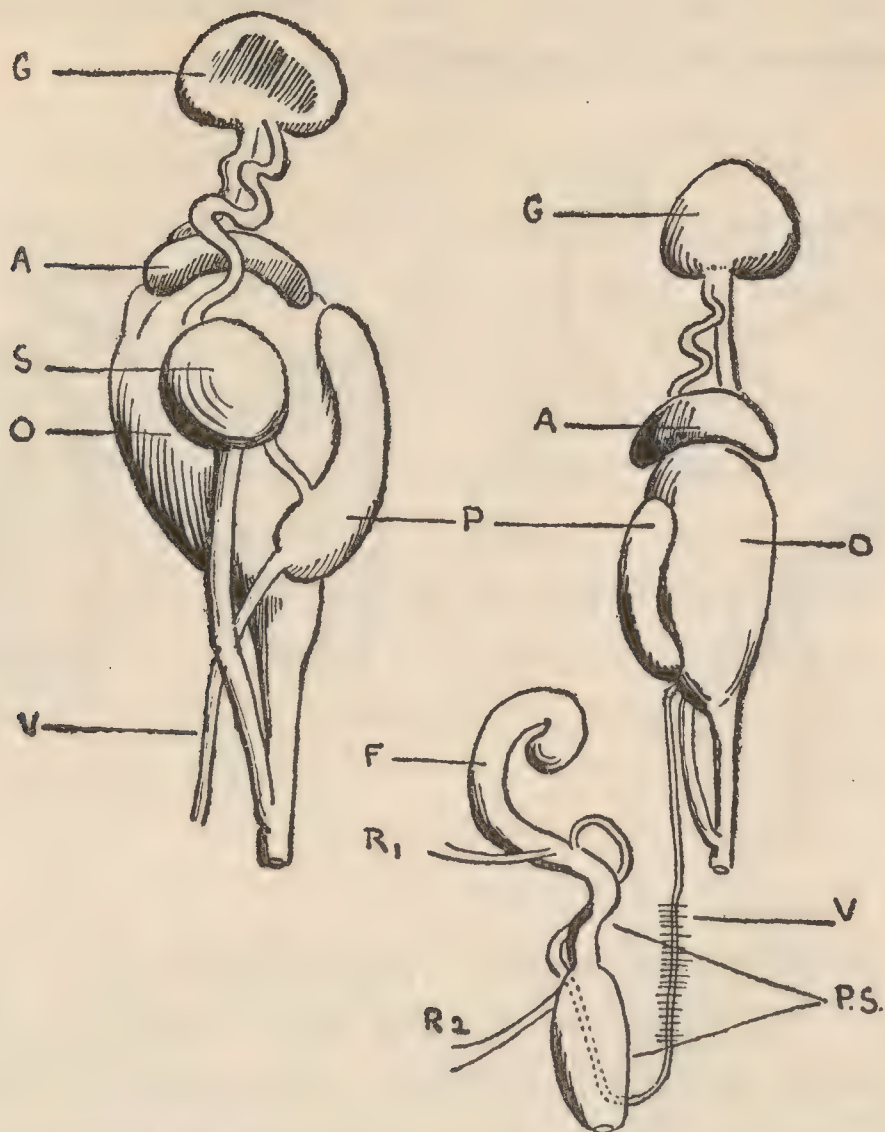


Fig. 12.

Fig. 13.

From the gonad the thick, white, convoluted vas runs behind the albumen gland and passes between the oviduct and the spermatheca to a conspicuous lemon-yellow prostate (*P*) very like that of *Planorbis corneus*. From the lower end of the prostate the vas runs beside the spermatheca duct, its walls becoming thicker and whiter as it descends. On reaching the body wall close to the female orifice it turns forward and runs beneath a layer of tissue to the distal end of the penis sheath (P.S.).

Here it runs upwards on the posterior surface of the penis sheath and coils around its upper end and enters the penis. The penis sheath is divided into a thinner proximal part about 2.5 m.m. long which then abruptly dilates to form the distal part of about the same length, with a median raphe on its anterior and posterior surfaces. A thin cylindrical penis occupies the proximal part of the sheath and ends in a curved brown claw opposite the junction with the wider distal part (fig. 14). From the point where the vas enters, a flagellum (*F*) arises. This is thicker than the sheath, with thick, glistening white walls, sharply bent on itself, and slightly increasing in diameter towards its blunt, rounded extremity. It has a small, simple lumen and is about 2.5 m.m. long. A thin retractor muscle passes

from the dorsal body wall to the junction of the penis with the flagellum, and another from the floor of the body wall to the proximal end of the dilated part of the sheath. The lower part of the sheath has a simple lumen without frills or appendages.



Fig. 14.

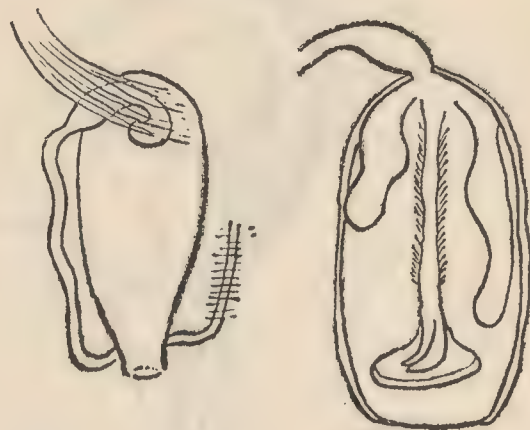


Fig. 15.

The condition differs in several respects from that of *Planorbis corneus* (Linn.). In *Planorbis* the vas after running forwards in the thickness of the body wall, as in *Isidorella*, enlarges slightly, and enters the sheath which is not divided into two parts of differing calibre (fig. 15). The sheath contains two frills with one attached and one free border, and between them a thickened ridge runs downwards to end in a pointed, grooved projection with thin lateral flanges. There is no flagellum and the retractor muscle from the floor of the body cavity binds the dilated termination of the vas down to the apex of the sheath.

Without an examination of other species of these two genera it would not be safe to correlate these structures. One might suppose that the sheath in *Planorbis* represents only the upper part of the *Isidorella* sheath; and that the ridge and the grooved and flanged projection corresponds with the clawed penis; and that the frills are additional structures analogous to sarcobela. On the other hand, one could suppose the dilated termination of the vas to be the penis, and the frills, ridge and grooved papilla to be in the nature of "guides," as has been suggested in the case of the sheath of *Lymnæa*.

In conclusion I wish to acknowledge Mr. Tomlin's kind help in the identification of the species described.



THE ALLEGED OCCURRENCE OF VERTIGO MOULINSIANA (Dupuy) IN CUMBERLAND.

By D. K. KEVAN.

IN view of the discovery of *Vertigo lilljeborgi* (West.) in Westmorland and Cumberland (1) I am doubtful whether *V. moulinsiana* occurs at Friars Crag, Keswick, as has been stated. I have to thank Prof. A. E. Boycott, Mr. Chas. Oldham, Dr. J. W. Jackson and Mr. A. S. Kennard for their assistance in trying to solve the problem and summarise below all that is presently known concerning the matter.

In 1895, the late Capt. W. J. Farrer (2) stated that he had taken four specimens of *V. moulinsiana* at the above locality. In 1901, Mr. B. B. Woodward (3) states that the record was subsequently withdrawn by Farrer as wanting confirmation, and this statement is referred to by Tomlin and Bowell (4), but no information can be traced as to when the record was actually withdrawn, or how the shells were re-named (if at all). In 1922, *V. moulinsiana* was put on record for Cumberland in the Recorder's Report for that year (5) but with regard to this, I am informed by Prof. Boycott that on Oct. 12th, 1922, Mr. Taylor (who had originally identified the specimens for Capt. Farrer, and who had overlooked or was not aware of the subsequent withdrawal by the finder) sent in a list of records which he had verified and which had not been entered in the new edition of the Census, and these, including *V. moulinsiana*, Keswick, W. J. Farrer, were admitted. Whether Mr. Taylor had re-examined Farrer's specimens, or had merely based the record on his original identification is a matter of conjecture. Dr. Jackson has looked through his collection (joint with the late Mr. R. Standen) but cannot find any of Farrer's Keswick specimens of *V. moulinsiana* and is of opinion that it may be a mistaken identification. The fact of the withdrawal of the record by Farrer himself undoubtedly points to the fact that he was not satisfied.

It seems likely that what Farrer really found was not *V. moulinsiana* at all, but *V. lilljeborgi*, for the following reasons.

Firstly, both the original record and its withdrawal took place before 1902 when the late Dr. Chaster and Mr. Tomlin re-discovered *V. lilljeborgi* in Ireland. Until that date (and even subsequently) the two species were frequently confused. Secondly, Cumberland (and Westmorland) does not contain the flat, low-lying type of country that *V. moulinsiana* appears to inhabit. Both topography and climate would seem to be unsuitable, although, *given the necessary conditions*, this does not preclude its eventual discovery in even more northerly

latitudes. It may be that *V. moulinsiana* will ultimately be found there and necessitate a revision of present ideas as to its habitat, but in the absence of Farrer's actual specimens or of other data that will throw light on the subject, Prof. Boycott concurs that the occurrence of this species in Cumberland is very doubtful and needs confirmation.

BIBLIOGRAPHY.

- (1) Kevan & Waterston. J. of Conch., Vol. XIX, p. 296.
- (2) Farrer, Capt. W. J. J. of Conch., Vol. VIII, p. 158.
- (3) Woodward, B. B. Vict. County Hist. Cumb., Vol. I, p. 99.
- (4) Tomlin & Bowell. J. of Conch., Vol. XII, p. 214.
- (5) Recorder's Report. J. of Conch., Vol. XVII, p. 29.

Ancylus fluviatilis Müll. bred in a bell-jar.—In a glass bell-jar with a diameter of 30.5 centimetres and a capacity of 21 litres, I installed on August 25th, 1930 two *Planorbis corneus* and a few very small *Dreissena polymorpha*; all had lived in another bell-jar in which it is certain there was no *Ancylus*. Some plants, *Elodea* and *Ceratophyllum*, were introduced from the local canal. The jar was then covered with a glass plate and left undisturbed until May 17th 1932, when, being wanted for another purpose, it was cleaned out. Some months before then—in the previous winter, but I have no note of the exact date—I chanced to see some very small and quite young *Ancylus* on the glass, and in May, 1932 there were some sixty half-grown shells with average dimensions of 4 mm. by 2.8 mm. How their parents—or ancestors—got into the jar is not clear; they must have been introduced in August, 1930, for the jar was not uncovered subsequently, and I can only surmise that they were on the weed from the canal; but, if that be so, it is odd that I have never before seen *Ancylus* in any of my many jars that have been furnished with plants from the same source. The characteristic habitats of *Ancylus* are stones in clear, swift streams, shallow mountain tarns and large lakes, places where the water is highly oxygenated, although it may be seen, often associated with *Vertigo antivertigo* and—of recent years—*Paludestrina jenkinsi*, in little trickles on sea-cliffs, which are apt to be dry or at any rate to have no appreciable flow, during dry weather, when the *Ancylus* may be left—not apparently to their detriment—on stones that are no longer submerged. Its occurrence in small closed ponds is, although not unknown, quite exceptional (see Jeffreys, *Brit. Conch.* I, p. 120 and Adams, *Collector's Manual*, edit. 2, p. 135). Whether *Ancylus* eschews such ponds because of their deficiency in oxygen—if indeed they be deficient—is not clear, but the fact that it can live and thrive in a bell-jar is perhaps worth recording.—CHAS. OLDHAM (*Read before the Society*, Dec. 7th, 1932).

THE TYPE OF GEOMELANIA WITH DESCRIPTION OF A NEW SPECIES.

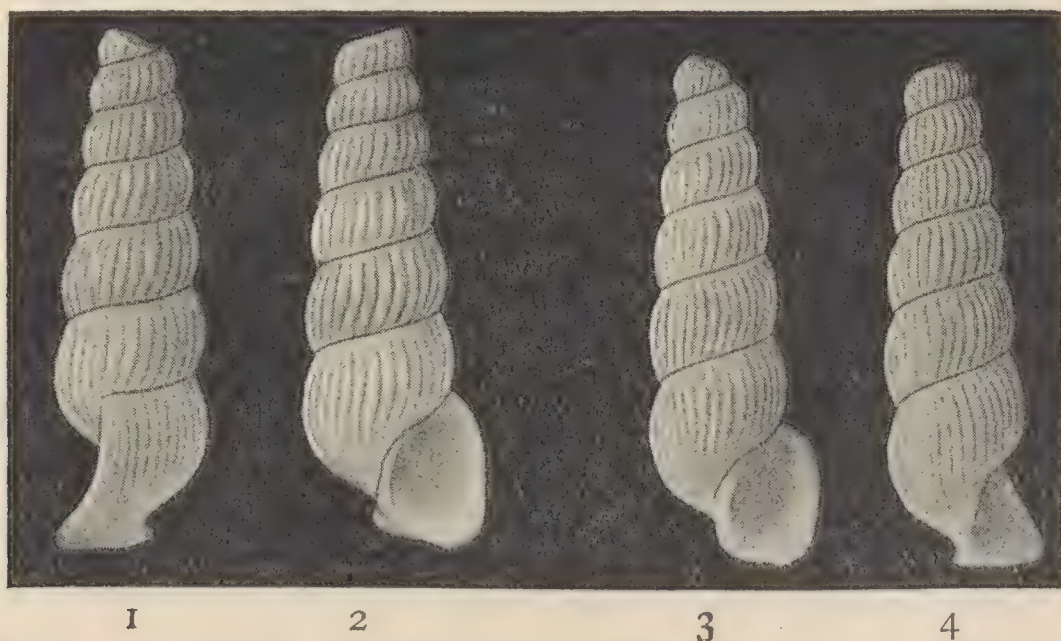
By J. DAVY DEAN, F.R.E.S.

of the Department of Zoology, National Museum of Wales.

(Read before the Society, December 7th, 1932).

THE genus *Geomelania* comprises a peculiar group of operculates belonging to the *Truncatellidæ* which have completely abandoned the neighbourhood of the sea. The genus was founded by Dr. Louis Pfeiffer in 1845 for *jamaicensis*, the only species then recognised and therefore the type (Proc. Zool. Soc. 1845, p. 45). In "Systematisches Conchylien-Cabinet," Lief. 95, pl. xxx, figs. 19, 20, Pfeiffer gave two figures. In the Cuming collection is a tablet, labelled as from "Savanah le Mar," the type locality, with two adult shells measuring 11.5 and 12.8 mm. respectively. The smaller was figured by E. R. Sykes in 1905 as "one of the actual types of the species" (Proc. Malac. Soc. vi. p. 225). The length given by Pfeiffer in original description is 12 mm.

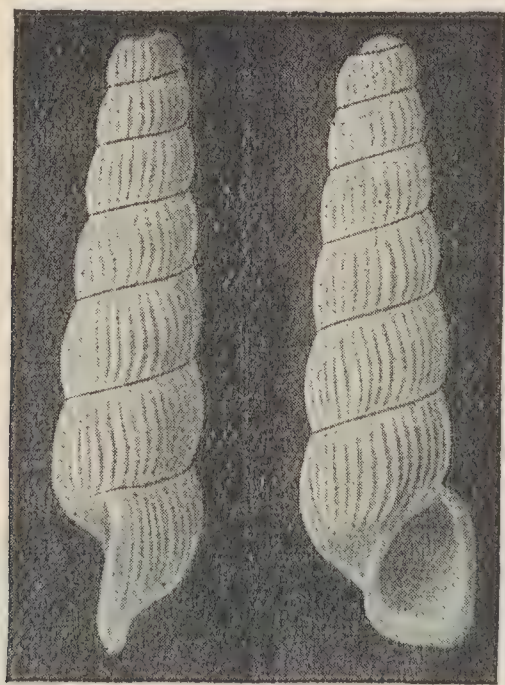
Geomelania affinis C. B. Adams, described in 1850 (Contrib. to Conch. p. 96) is identical. By courtesy of Dr. Pilsbry two forms of this species are shown (Figs. 1 to 4). Variation in the labrum and in the diameter of the shell seem to be related in this genus, though intermediate forms exist. Figures 1 and 2 closely resemble the type-specimen of *jamaicensis* Pfr.



Pilsbry gives the altitude as 12.8 mm., diam. 4.3 mm., six remaining whorls. In a second specimen (Figs. 3-4) the form is more slender, alt. 12.7 mm., diam. 3.5 mm., ribs a trifle narrower, connecting forms present (Pilsbry in litt.).

Geomelania cumingi nomen nov. figs. 5-6. (= *jamaicensis* C. B. Ad. non Pfr.)

That Adams should have described a *Geomelania* identical with the type-species is only to be explained by the fact that the shell he received from Cuming and described in "Contributions to Conchology," p. 18 as "*jamaicensis* Pfeiffer," was unrecognised by Cuming as another and quite distinct species. Adams' description is as follows: "Shell conic-cylindrical; whitish; densely sculptured with strong, transverse (direction of growth), somewhat angular ribs, which become obsolete only on the anterior extremity of the last whorl; spire with rectilinear outlines; apex truncate with the loss of — whorls; nearly seven whorls remaining, rather convex, with a well impressed suture; aperture ovate, widely and deeply effuse; labrum much thickened, reflected, very much produced in the lower part; labium rather thick, separated by a slight groove from the penultimate whorl, separated above from the labrum by a small sinus . . . length .66 inch . . . greatest breadth .2 inch . . ." (Contrib. to Conch., p. 18). Locality: Jamaica.



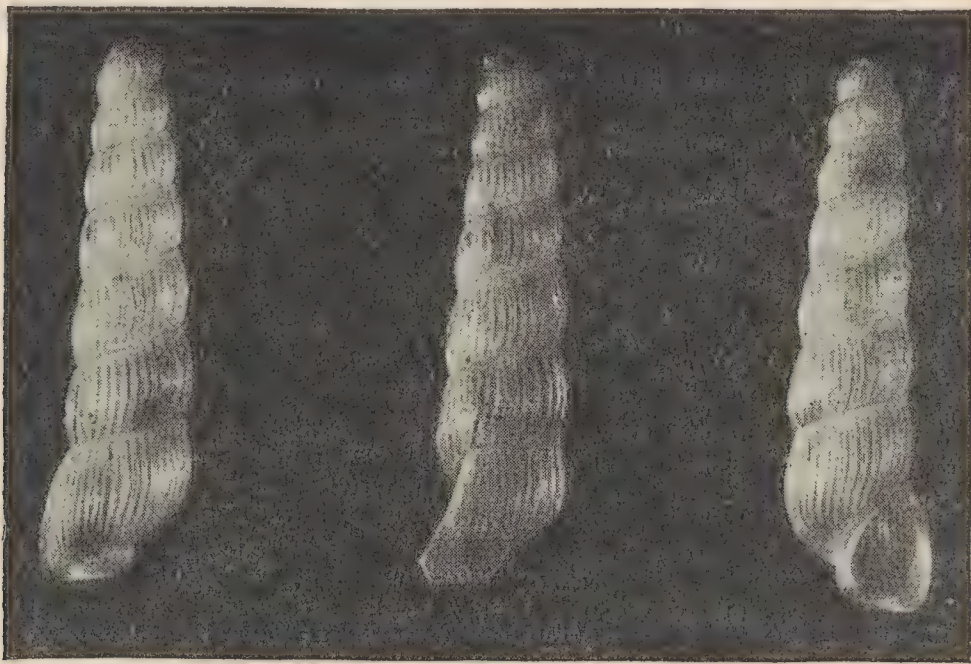
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This shell was returned eventually to Cuming but fortunately, in 1850, Adams received a second specimen from Chitty "precisely like the Cumingian specimen." Pilsbry writes "there is in the collection a set of three specimens which Adams subsequently received from E. Chitty. One is very young, another is broken, leaving only one perfect shell. Describing this, Pilsbry says "The peristome is thickened, the outer lip slightly protractive, very weakly sigmoid. Basal margin a little concave in front view. Riblets curved, *disappearing at the base*. There are $3\frac{1}{3}$ riblets in one mm. on the ventral face of last whorl. About 18 can be counted on face of penultimate whorl. On the last half turn they are finer. Length 15 mm., diam. 4.2 m.m. diam. above aperture 3.7 mm.; $6\frac{1}{3}$ whorls remaining. Two views of this specimen shown above, which should be regarded as the type,

are taken from photographs kindly lent by Dr. Pilsbry. There are also good specimens of the species in the Chitty Collection at the British Museum labelled *jamaicensis*, average length 14 mm. There is another set of comparable specimens of which the largest measures 16 mm. (Peile in litt.).

Geomelania peilei sp. nov. figs. 7-9. Shell conic-cylindrical; almost white in colour, glossy; sculpture about thirty well-marked arcuate transverse ribs on lower whorls, continuing to the sutures; whorls somewhat convex, six in number to point of decollation; longitudinal striation slight; aperture ovate, widely and deeply effuse; a well-marked basal groove behind the labrum which has a very pointed extension; between the columella and inner lips, a small fillet; outer lip grooved towards the suture of the penultimate whorl. Alt. 13 mm., diam. (penultimate whorl) 3 mm.



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Locality: Montpelier, St. James, Jamaica (Coll. G. A. Martin). Type in National Museum of Wales.

There is again a certain amount of individual variation in the labrum which may possibly be a sexual character. One form is pointed with a distinct posterior groove; the other is nearly square with obsolete groove. The new species somewhat resembles *fortis* C. B. Ad. but is very much smaller, and differs also in the costæ.

I am indebted to Lieutenant-Colonel A. J. Peile for kindly drawing my attention to the distinctness of these shells, and for comparing them with the species of *Geomelania* at the British Museum; to Mr. W. E. Howarth, F.G.S., Geological Department, National Museum of Wales, for the above photographs of the type specimen; to Dr. H. A. Pilsbry for kind permission to use the above photographs of *affinis* C. B. Ad. and *jamaicensis* C. B. Ad., and to Professor H. H. Plough, Curator of the Museum of Zoology, Amherst College, Mass. for his kindness in supplying information.

NAMES OF BRITISH MARINE MOLLUSCA, I.

By R. WINCKWORTH, M.A.

(Read before the Society, January 4th 1933).

I SHOULD like to record my thanks to those who have offered criticisms of the list recently published in this Journal; and it seems desirable to put on record some of the criticisms received. With those who merely complain that I have altered familiar names, I can only express my sympathy; for example I deplore the change of the familiar name *Chaetoderma* to *Crystallophrisson*, but there is no escape when *Chaetoderma* had already been used five years earlier for a genus of fishes; and the majority of changes necessary are due to the more familiar name being pre-occupied. On the question of *nomina conservanda* I am of opinion that in general they should be avoided, and that there is less danger to stability of nomenclature in strictly following the law of priority than in invoking on casual occasions a reversal of judgment to protect a later name. Thus many people, including myself, would like to retain *Aplysia*, but it is too late; *Tethys* has been recognised as the valid name for *Aplysia* for nearly forty years, and while Eales, Engel and some others prefer to use *Aplysia*, the bulk of recent literature, including Pilsbry and O'Donoghue, refers to the genus as *Tethys*. I might have tried to use *Scaphander* as against *Tricla* which does not figure widely in literature yet, but I should only have postponed the day when the earlier name would gain recognition.

The following corrections should be noted:—

- p. 218. After *Callochiton* Gray add 1847.
- p. 228. After *Trivia* for Gray read Broderip.
- p. 231. After *leufroyi* (Michaud 1821) add Mediterranean.
- p. 244. Lines 6 and 8, for FH2 read FH1.
- p. 250. For *Odostoma* read *Odostomia*.

I noticed this last error in time for correction to be made in the reprints which have been issued as a separate pamphlet by the Society.

TROCHIDÆ (p. 220).

I am indebted to Mr. H. Watson for the following remarks on certain groups of this family, and I see no reasons for not accepting his arrangement.

“As regards *Clelandella*, although you rightly state (p. 250) that the radula confirms the fact that it is much nearer *Jujubinus* than *Calliostoma*, you might have added that in the form of the admedian teeth, as well as in the form of the shell, this new subgenus of *Cantharidus* is not quite so far from *Calliostoma* as are *C. (I)*

exasperatus and *striatus* for example. For this reason I should have been tempted to place the British groups in the following order:

CALLIOSTOMA
CANTHARIDUS.

S.G. CLELANDELLA.

S.G. JUJUBINUS.

GIBBULA.

S.G. OSILINUS

S.G. GIBBULA S.S.

"You place *Osilinus* under a separate genus, *Monodonta*, but the radula of *lineata* does not seem to resemble that of *Monodonta labio*, etc., as closely as it does that of *Gibbula*, and unless you know of some other anatomical distinction between *Osilinus* and *Gibbula*, I should not have thought that the difference in the shells was of more than subgeneric importance."

LITTORINA (p. 221).

Mr. J. Colman in a recent paper,¹ of which he kindly sent me a copy, offers some interesting remarks on variation and as a result of measurements of nearly a thousand shells he concludes "The names *L. littoralis* (L.) and *L. palliata* (Say) must go into synonymy under *L. obtusata* (L.), since it is shown that there is no division possible between forms to which these names have been given." An opinion based on careful measurements of three linear dimensions of so much material demands consideration, and I immediately accepted his conclusion. I was however requested to give detailed consideration to this matter, which necessitated my looking into the question with more care; and, in spite of Colman's figures, I feel it is hardly safe to amalgamate the two forms *obtusata* L. (= *arctica* Möller + *palliata* Say) and *littoralis* L. (= *obtusata* Jeffreys, and Sars + *neritiformis* Brown). I am ready to admit it is quite possible he is right and there would be no harm in treating the two forms (both of which have a wide variation) as two subspecies called *L. obtusata obtusata* and *L. obtusata littoralis*, pending further inquiry. I have looked through the material available in my collection, which consists of over 300 British and a few French examples, but only 31 of the *palliata* group (from Maine, Labrador and Iceland); so that unfortunately I have no examples from the critical area of Norway where the two forms overlap, *obtusata* occurring from Finmark northward (*palliata* of G. O. Sars) and *littoralis* from Finmark southward (*obtusata* of G. O. Sars). Species of *Littorina*, not only here, but also in the tropics, are so variable in growth, that I think comparisons of length, height and

¹ A statistical test of the species concept in *Littorina*. Biol. Bull., vol. 62, p. 223 (June, 1932)

breadth alone will not solve the problem of whether forms are conspecific. Two points to which attention might be directed are (a) the coarse anatomy—*arctica* is said to have cirrhi round the foot which are lacking in *littoralis* and (b) the radula—Sars¹ figures radulæ of both species, showing minor but obvious distinctions which may however be individual variations. I still imagine I can separate the two forms on shell characters, e.g. the lip, anterior junction of mouth and previous whorl, and the spire; and especially in that the apical whorls of *obtusata* always have a marked suture and sutural angle, while the young whorls of *littoralis* are continuous, and in outline show almost an even curve across the suture.

HYDROBIA JENKINSI (p. 221).

Thiele in his "Revision des Systems der Hydrobiiden"² points out on p. 373 that this species should be placed in the genus *Potamopyrgus*; shell characters and radula both indicate this allocation. As the type species *corolla* and other species are from New Zealand, this strongly suggests the origin of the species which appeared over 40 years ago and has now spread over a large part of England. *H. jenkinsi* should therefore be removed from *Hydrobia* and placed after *Pseudamnicola confusa* in the genus

POTAMOPYRGUS Stimpson 1865. *Melania corolla* Gould.

BITTIUM (p. 224).

It has been suggested to me that the Channel Island form allied to *Bittium reticulatum* should receive recognition as a distinct species in view of the absence of intermediate forms between *reticulatum* and *simplex*. This view requires the addition on p. 224 under *Bittium* of

S simplex Jeffreys 1867. FH3, 193 (var). J4, 259.

TRIVIA (p. 228).

As Peile³ anticipated from the examination of radulæ, the two English forms of *Trivia* must be considered as distinct species. This view has been confirmed by Dr. M. V. Lebour⁴ at Plymouth, where she has found two distinct forms of *Trivia* through all the larval stages. Conchologically the two species are very close, and diagnosis is made more difficult by the apparent existence of unspotted individuals of the spotted form and faintly spotted individuals of the unspotted form. However it is certain we must recognise on the British list two separate species:—

¹ Mollusca Reg, Arct. Norv., plate VI.

² Zool. Jahrb. Jena, Syst. vol. 55, p. 351 (1928).

³ Proc. Malac. Soc., vol. 16, p. 195 (1925).

⁴ J. Mar. Biol. Assoc., vol. 18, p. 477 (1933).

monacha (da Costa 1778).

arctica (Montagu 1803).

the name *Trivia* should be assigned to Broderip instead of Gray.

TRITONIA *versus* SPHÆROSTOMA (p. 234).

In their list of British nudibranchs,¹ Iredale and O'Donoghue have rejected the name *Tritonia* and substituted the later name *Sphærostoma*. Dr. O'Donoghue has very kindly written to me at length to justify this action, and as the matter involves a question of principle, I think it worth while to give arguments on both sides in some detail. I am not yet wholly convinced that his point of view is the right one, but he is an acknowledged authority on nomenclature as well as on zoology.

Cuvier originally defined the genus *Tritonia* in the following words²:

“On pourroit séparer du genre des *doris*:

(a) LES TRITONIES (*tritonia*).

Qui ont, comme les limaces, le corps rampant et convexe sur le dos. Le nombre des tentacules qui entourent la bouche varie de deux à huit: les organes de la respiration sont des espèces de panaches portés par des pédicules, ou des faisceaux de fibres régnant tout le long du dos.”

This description unfortunately names no species, but it clearly includes such animals as *Idulia* (= *Doto*), *Dendronotus* and *Sphærostoma*. The selection of a type species is therefore governed by opinion 46, “In genera published without mention, by name, of any species, no species is available as genotype unless it can be recognised from the original generic publication . . . if several species are referred to but not mentioned by name, one of these species must be taken as type; if it is not evident from the original publication of the genus how many or what species are involved, the genus contains all the species of the world which would come under the generic description as originally published, and the first species published in connexion with the genus becomes ipso facto the type.”

The next use of *Tritonia* was by Meigen in 1800 for a genus of flies, obviously preoccupied by Cuvier's use for a genus of nudibranchs.

Lamarck in 1801³ adopted Cuvier's genus. Unfortunately he modified the description to include *Doris clavigera* Müller, which is the only species he mentions and which from the details given by

¹ Proc. Malac. Soc., vol. 15, p. 195 (1923).

² Tableau Elem. Hist. Nat. Anim., p. 387 (1797).

³ Système, p. 65.

Cuvier cannot be included in the original genus. The next use of *Tritonia* is by Cuvier himself who fully described *Tritonia hombergii* in a memoir¹ published in 1803. This species falls within the original definition of the genus, and I therefore maintain that *Tritonia* Cuvier 1797 is a valid genus with type *Tritonia hombergii* Cuvier 1803.

Dr. O'Donoghue, however, takes a different view, which he puts as follows. A generic name is only valid if "published and accompanied by an indication, or a definition or a description" (Article 25 of the Code). Opinion 1 defines 'indication.' Opinion 2 states that a name "refers to the designation by which the actual objects are known. In other words, we name the objects themselves, not our conception of said objects. Names based upon hypothetical forms have therefore no status in nomenclature and are not in any way entitled to consideration under the Law of Priority"; it may be summarised by saying that names must apply to actual objects, not to ideas, a point emphasized in other opinions.

Examine Cuvier's first account of *Tritonia* in 1797 and you will see

- (a) The generic name was not published with an indication.
- (b) The generic name was not published with a definition including an actual species but a definition of an idea. He probably had in mind *Doto* and *Sphærostoma*, i.e. no definite animal but a group that were to be distinguished from the more typical *Doris*. Further Lamarck in 1801, working in the same city and using the same language as it was then understood, and not reading into the words what modern knowledge tempts us to do, puts a totally different but actual animal into the theoretical genus.

(c) The generic name was not published with a description of any species, but only a general or ideational description.

(d) In so far as this genus is concerned, Cuvier in 1797 gives no binominal or binary name either directly or by reference to any particular animal with a specific name.

Therefore as *Tritonia* Cuvier 1797 complies with no single requirement of the Code, it cannot stand: it is a name only and has no reference to any particular individual species.



¹ "Memoir sur le genre *Tritonia* avec la description et l'anatomie d'une espèce nouvelle, *Tr. hombergii*." Ann. Mus. H. N. Paris, vol. 1. p. 480.

NOTE ON THE COLOURATION OF *NUCELLA LAPILLUS* (L.).

By E. ST. JOHN BURTON, F.L.S., F.G.S.

(Read before the Society, September 10th, 1932).

THE colour of *Nucella lapillus* (L.), is manifested by 5 variations from the normal, which is white. Examples having brown bands on a white ground are fairly common in some localities. White with yellow bands is less common. Yellow, or orange is local; yellow with brown bands is comparatively rare; so also is chocolate brown. Definite red or purple does not occur.

Specimens showing the above variations may all be found living together at Hengistbury Head, in Hampshire, and no doubt are associated elsewhere, under the same local conditions.

A few remarks on the subject of molluscan colouration may not be out of place; the secretion of pigment by the mantle of a mollusc is said to depend greatly on the action of light, and Forbes in a paper read before the Royal Society (Vol. vii, p. 21), stated that Testacea found below 100 fathoms were colourless, even though, in a lesser depth, the same species were vividly striped or banded. Colours were well shown on shells from 50 fathoms to shallow-water. Jeffreys in Brit. Conch., Vol. i, Introduction, p. 1, raised objections to this, his own experience leading him to form a different conclusion. Brightly coloured specimens he obtained from 80 fathoms or more, and he recalls that Dr. Wallich obtained in the Arctic Sea normally coloured starfishes from the depth of 1,260 fathoms (7,560 feet). Crustacea of bright colours were recorded by Torell from Spitzbergen at 1,400 fathoms (8,400 feet). It has been said that tropical cowry-shells never expose themselves to the rays of the sun, but this may be due to the common tendency which they share with many other mollusca to shelter from the more exposed portions of a reef, or ledge of rocks. The well-known pelagic mollusc, *Ianthina*, habitually turns the base of the shell upward, and that part is deeply dyed with violet (Woodward, Manual of the Mollusca, 1851, p. 47).

Jeffreys (Brit. Conch., Vol. iv, pp. 184-5) has referred to the colouring-matter of mollusca. He first mentions that Liebig attributed the red and blue colours of flowers to ammonia: "but whence is the ammonia derived? We know that gardeners can produce differently tinted flowers in an Hydrangea or Dahlia by the empirical application to the soil of certain mineral admixtures. Cannot nature do as much for marine animals by the prescient combination of similar ingredients in the sea water? Mr. C. Stewart has satisfied me that *Littorina obtusata* when calcined, or even subjected to the heat of a lamp-flame,

quite loses its colour, which, as he remarks, would not be the case if that colour had a mineral for its base. But many minerals possess an intense colour which they lose entirely when heated to a certain temperature. The late Professor Forchhammer, in a lecture on the metals in ashes of plants (Report of the Association of Agriculturists, 1855), states that manganese constitutes the colouring matter of the brown rings or bands and lip of certain snails (for example, *Helix nemoralis* L.), the snail getting the manganese from the plants on which it feeds, and these again from the soil. He also confirms a discovery previously made by chemists that the field and garden slugs contain copper, which occurs in wheat and other cultivated plants."

The subject requires much further elucidation but it may be worth while to remark that the shells of *Nucella lapillus* on clay-rocks are usually white with brown bands, and that on limestone or on granite rocks the shells may be more varied in colouring, though white is the dominant hue. They never approach red under any circumstances of *loci*, so far as the writer has been enabled to observe, although they may exhibit a bright orange tint which, when the shells approach maturity, frequently becomes much paler. The term 'reddish' is sometimes loosely employed, as by Jeffreys (Brit. Conch., Vol. iv, p. 276).

It might be suggested that the variations in colouring of *N. lapillus* would depend on the texture of the rocks constituting the habitat of the species, but different colouration appears to be produced upon shells existing together on the same rocks and in the same locality. Absolutely white specimens are found alongside luteous and chocolate forms. A large number, 500 examples, collected by the writer, all came from yellowish-brown ironstone rocks, white shells in every case predominating.

The pigment has doubtless a considerable degree of permanency even under prolonged conditions of diffused light, so fatal to many vegetable and mineral colours. Sunlight acting upon brightly-tinted mollusca has very little effect as long as the animal is alive: after death, however, a moderately strong but continuous light will cause colours to fade in a marked degree. Apparent fading is sometimes attributable to atmospheric changes and the degree of humidity in the surrounding air, which causes a slight disintegration of the surface of the shells.

ADDITIONAL NOTES ON THE LAND AND FRESHWATER MOLLUSCA OF SUSSEX.

By J. GORDON DALGLIESH, F.L.S.

(Read before the Society, February 3rd, 1932).

FORMS OF *HELIX ASPERSA*, Müll.

Var. *exalbida*, Menke.

THIS form in Sussex appears to be sporadic, not always living in well-defined colonies. Single examples have been taken at Henfield, West Blatchington, Hove, Glynde, Clayton, and in Charlton Forest above Cocking. *Exalbida* is often associated with *unicolor* and its sub-var. *grisea*, and where these two forms occur graduations can be traced from the banded unicolorous form to the true *exalbida*. Swanton quoting Jenner (A Catalogue of the Land and Freshwater Mollusca of Sussex, Zoologist, 1915) records a colony at Newhaven. In the lower Cuckmere Valley and in the neighbourhood of Jevington there is a flourishing colony (R. A. Adkin *in lit.*), and another was discovered last year (1931) at Sompting, near Worthing. This colony extends from under the Downs right into the village of Sompting. Here *exalbida* may be regarded as abundant.

Var. *unicolor*, Moq-Tan. with its subvar *grisea*, Moq-Tan. is to be found sporadically in beech hangers, or may form colonies. Such a colony occurs on an ivy-covered wall at Upper Beeding, and quite close to it *exalbida* has been obtained. Here the examples range from bandless to 12345. Mr. H. Beeston kindly sent me specimens of this form from Ditcham Wood in Hampshire not far from the Sussex border, and writes that these were taken before the timber was extensively cut. The following year the colony was practically "wiped out," having been eaten by rats. Mr. Beeston goes on to say that "this form is to be found mainly on the southern side and slopes of the South Downs, from them down to the sea; 12345 is not common." In Ditcham Wood and Charlton Forest there is a form of *unicolor* almost equalling in size and shape *Helix pomatia*, L. with a very thick shell.

Var. *flammea*, Pic.

Local, and not occurring generally. Around Lancing and Upper Beeding it is fairly numerous, and a very beautiful variety with flammular markings on a unicolorous ground colour is rarely to be obtained. Some shells are almost *nigrescens* with flammular markings. One specimen obtained near Brighton had the peristome brown and the rib pink. This is the only *aspersa* with a definitely coloured lip obtained.

Var. *nigrescens*, Moq-Tan.

On the cliffs from Roedean to Saltdean a dark form is frequent, closely approaching true *nigrescens*. Melanism in animals has been said to be due to various environmental factors, e.g. humid atmosphere, extremes of temperature, strong light and certain metallic salts (Aubertin, Ellis and Robson. The Nat. Hist. and Variations of *Cochlicella acuta*, Müll. Proc. Zool. Soc. Lond. 1930).

It has been suggested (*supra*) that the clue to local differences in the incidence of melanism might be the presence of some food-plant or plants which select melanic-inducing salt from the soil, and that the presence of such salts might be determined by geological formations as well as by sea-borne spray.

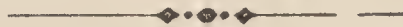
Here on the cliffs at Roedean and Saltdean *Helix aspersa* associates with *Helicella caperata*, Mont., *H. virgata*, Da C., and *Cochlicella acuta*, Müll.

No form of anything approaching melanism has been discovered among these three species, on the contrary, for it is here, although rarely, that a beautiful form of *Helicella virgata* having translucent bands suffused with pink is to be found, and *Cochlicella acuta*, var. *strigata*, Menke lives in well-defined colonies.

Adams (Collector's Manual of Brit. L. and F.W. shells) gives var. *albo-fasciata*, Jeff. as having bands (123) and (45), leaving a white band round the centre. Specimens from Bramber, West Blatchington and Saddlescombe answer to this variety save that here the band round the centre—or rather the ground colour—is buff. This is a very striking, handsome form being very characteristic of the Saddlescombe area.

Var. *semifusca*, Cockerell.

Very rare. Obtained in company with var. *nigrescens* on the cliffs at Roedean.



“**Helix Tor**” and “**Snaily House**.”—On the western edge of Bodmin Moor, three miles south and a little east of Camelford and a mile and a half north east of St. Breward, Bartholomew's half-inch map shows “**Helix Tor 963**.” We went there on 23rd July, 1931 with the idea that there might be either some odd patch of calcareous ground swarming with *H. virgata* or something which might have reminded the engineers who made the survey of a screw. It is a pleasant place and worth a visit but neither conjecture was right. The piles of rock are, it is true, split but the pieces are bedded very horizontally and walking round about them we saw nothing helical. With a bottle of acid we could find nothing which fizzled, nor

could we discover any mollusca beyond two or three ordinary-looking *Agriolimax agrestis*, though there is a good deal of shelter in the nooks and crannies of the main rock mass and some ivy. How the place came to get the name we do not know: Mr. H. Jenner suggests that it may have to do with the Cornish *Helik* = willows (cf. Welsh *helyg*, Latin *salix*) though there are no standing willows in sight, nor any house of that name near by: Mrs. M. V. Green tells me that at Caen in Normandy there are some artificial conical mounds with spiral paths of ascent called "escargots." And the difficulty does not become any less when we find that on the current six-inch ordnance survey map the place is labelled "Alex Tor." Bartholomew's map is again the authority for "Snaily House" which lies at an altitude of just under 1,000 feet by the East Dart, a mile and a half below Postbridge on Dartmoor. On 30th July, 1931, I found there the ruins of a small isolated farmhouse with a biggish shed close by, well built with mortared walls and derelict for some considerable time, since there were no remains of wood. Apart from the mortar, there was no reaction with acid in the stones of the house, the rocks in the neighbourhood or in the earth by the five beeches, three ashes, scotch fir and thicket of sloes just above the house; the water oozing from the spring had a pH of about 6. There were no snail-like or other fossils visible in the building stones nor had ammonites been brought and built into the fabric as one sees sometimes in Dorset and Wilts. No cultivated plants were found; the moor comes up to the walls and the interior is full of nettles with some fern and brambles. Among these, the ground being distinctly calcareous owing to the mortar which had fallen down, *Arion minimus* was abundant and *Arion circumscriptus* and *Cochlicopa lubrica* were common; I found also *Arion hortensis*, *Hyalinia cellaria*, *Hy. alliaria*, *Vitrina pellucida*, *P. rotundata*, *H. nemoralis rubella* (five young, four dead) and *Pupa umbilicata*; *Arion ater* was common as it was on the surrounding moor generally. There is therefore nothing present now which would suggest to the casual observer that the place was "snaily," though the actual snail fauna is considerable for a locus at that altitude and much larger than would be found anywhere on the open moor. In Postbridge I had from three independent sources the tale that "a long time ago" two old ladies used to live in the house and that as they never bought any food people wondered how they did. Ultimately illness or death let in their neighbours who found tubs of pickled slugs and snails. The legend is, I fancy, a widespread one; it occurs in Quiller Couch's tale "The Outlandish Ladies" (in the volume "Noughts and Crosses") and the notion that snails are the last refuge of the destitute is found in H. G. Graham (*The Social Life of Scotland in the Eighteenth Century*, 1899, vol. i, p. 147), who records that at the end of the 17th century the starving people in Peeblesshire gathered snails in the churchyards and stored them for the winter. Snaily House may of course be the genuine site of an original occurrence and the truth of the tale is not disproved by the fact that there are no *aspersa* there now. There well may have been when it was inhabited and the garden cultivated for at Postbridge, nearly 100 feet higher and in a more exposed situation, *aspersa* is by no means uncommon in the walls and gardens: *Limax maximus* also occurs there. This is a good example of how habitation and cultivation allow *aspersa* to colonise areas in which under more natural conditions it would have no chance of survival, shelter and lime being probably the immediate considerations: in gardens it extends even to Orkney (above p. 163).—A. E. BOYCOTT (*Read before the Society*, Dec. 7th, 1932).

PROCEEDINGS OF THE
CONCHOLOGICAL SOCIETY OF GREAT BRITAIN & IRELAND.
ANNUAL REPORT (*continued from p. 316*)

Early this year, Mrs. Taylor and family generously presented to the Society the collections and greater part of the library of the late J. W. Taylor. These gifts add considerably to the property of the Society and consist of two cabinets of British and foreign non-marine shells including many important varieties and locality specimens and a few types such as *Physa fusiformis*, *brisbanica* and *beddomei* from Australia, described by Nelson and Taylor in the Journal of Conchology, vol. ii, (pp. 288-289); reprints and pamphlets mostly classified under countries; and the note-books forming the basis of the Monograph. A card-catalogue of the literature has been taken in hand by the Hon. Librarian and is nearing completion. The note-books appertaining to the Monograph are in the hands of the Hon. Recorder for Non-Marine Mollusca for the present, and a small committee consisting of members of this Society and of the Malacological Society has been formed to consider the possibility of continuing and completing the Monograph.

Additions to the Cabinet have been received from Dr. A. E. Boycott, Mr. Hans Schlesch and Mr. H. H. Bloomer, the last consisting of a collection of malformed specimens of *Anodonta cygnea* from Sutton Coldfield, described and figured in the Journal of Malacology, vol. vii, part 6, 1900, pp. 136-138, pl. vii. This accession was inadvertently omitted from last year's Annual Report.

Additions to the Library have been made by Messrs. J. R. le B. Tomlin, H. H. Bloomer, A. S. Kennard, C. Oldham, Hans Model, Hans Schlesch, W. B. Marshall, S. Hirase, W. J. Clench, A. Nobre, C. R. Boettger, J. Bequaert, Drs. P. Bartsch, H. W. Miles, and E. W. Bowell, and by Miss Nora Fisher.

RECORDER'S REPORT (Non-Marine Mollusca).

SINCE the last report (vol. xix, p. 184) 100 new records have been authenticated for the Census.

Cornwall W. (1):—*Pisidium milium*, *P. personatum*, *P. subtruncatum* (C. Oldham).

Cornwall E. (2):—*Milax gracilis* (C. P. Hurst).

Somerset S. (5):—*Milax sowerbii* (N. G. Hadden), *M. gracilis* (E. F. Hornor).

Somerset N. (6):—*Vitrina major* (Callow by Axbridge), *Agriolimax laevis* (A. E. Boycott).

Wilts S. (8):—*Milax sowerbii* (A. E. B.).

Isle of Wight (10):—*Pisidium obtusale* (L. E. Adams).

Hants S. (11):—*Milax sowerbii* (F. G. Maunsell).

Sussex W. (13):—*Milax gracilis* (M. M. Worley).

Essex S. (18):—*Milax gracilis* (J. V. Fortescue).

Middlesex (21):—*Milax sowerbii* (F. Quay and W. J. Stokes).

Berks (22):—*Milax sowerbii* (M. Draper).

Bucks (24):—*Milax sowerbii* (A. E. Boycott).

Suffolk W. (26):—*Arion subfuscus*, *A. circumscriptus* (A. E. Boycott).

Gloucester E. (33):—*Milax sowerbii*, *M. gracilis* (L. A. Smith).

Gloucester W. (34):—*Milax sowerbii* (H. Chambers).

Carnarvon (48):—*Pisidium conventus* (C.O.: see above p. 276).

Lincoln N. (54):—*Milax gagates* (C.O.).

Lancashire W. (60):—*Paludestrina jenkinsi* (A. E. B.).

Yorks N.E. (62):—*Milax gagates* (G. Berwick).

Yorks S.W. (63):—*Milax sowerbii* (F. H. Lumb and J.E. Midgley).

Durham (66):—*Milax sowerbii*, *M. gracilis*, *Limax flavus* (B. R. Lucas), *Pisidium subtruncatum* (E. P. Blackburn.)

Northumberland S. (67):—*Planorbis corneus*, *Pl. carinatus*, *Pisidium lilljeborgii* (E.P.B.).

Westmorland (69):—*Paludestrina jenkinsi* (A.E.B.).

Cumberland (70):—*Vertigo lilljeborgi* (D. K. Kevan); the record of *Vertigo moulinsiana* from Keswick (vol. xvii, p. 29) should be withdrawn pending confirmation; information as to the whereabouts of W. J. Farrer's collection would be welcome.

Isle of Man (71):—*Milax gracilis* (C. I. Paton).

Dumfries (72):—*Zonitoides nitidus*, *Punctum pygmæum*, *Vertigo antivertigo*, *V. lilljeborgi*, *Succinea elegans* (pfeifferi), *Ancylus lacustris*, *Limnæa auricularia* var. *lagotis* (acuta), *Planorbis glaber*, *Valvata cristata*, *Pisidium hibernicum*, *P. lilljeborgii*, *P. nitidum* (D. K. Kevan and A. R. Waterston).

Kirkcudbright (73):—*Agriolimax lævis*, *Vertigo antivertigo*, *V. lilljeborgi*, *Margaritana margaritifera* (D. K. K. and A. R. W.).

Wigtown (74):—*Agriolimax lævis*, *Hyalinia pura*, *Punctum pygmæum*, *Vertigo antivertigo*, *V. substriata*, *V. lilljeborgi*, *Succinea putris* (D. K. K. and A. R. W.).

Ayr (75):—*Agriolimax lævis*, *Vertigo lilljeborgi*, *Planorbis albus*, *Pl. contortus*, *Valvata piscinalis* (D. K. K. and A. R. W.).

Selkirk (79):—*Pisidium cinereum* (casertanum), *P. personatum* (D. K. K. and A. R. W.).

Edinburgh (83):—*Milax sowerbii* (E. Dunbar), *M. gagates* (A. R. W.).

Linlithgow (84):—*Pisidium obtusale* (D. K. K. and A. R. W.).

Fife (85):—*Vertigo antivertigo* (A.R.W.).

Stirling (86):—*Vertigo antivertigo*, *V. substriata*, *Pisidium cinereum*, *P. henslowanum*, *P. hibernicum*, *P. lilljeborgii*, *P. nitidum* (D. K. K. and A. R. W.).

Perth W. (87):—*Pisidium milium*, *P. nitidum*, *P. obtusale*, *P. subtruncatum* (D. K. K. and A. R. W.).

Perth Mid. (88):—*Vertigo antivertigo*, *Limnæa auricularia* var. *lagotis* (A. R.W.), *Vertigo lilljeborgi* (D. K. K. and A.R.W.).

Perth N. (89):—*Limax cinereoniger*, *Vertigo lilljeborgi*, *V. substriata* (A.R.W.); the record for *Limnæa burnetti* should be withdrawn.

Easternness (96):—*Hyalinia nitidula*, *Pyramidula rotundata*, *Acanthinula lamellata*, *Clausilia rugosa* (A. E. B.).

Dumbarton (99):—*Pisidium cinereum*, *P. hibernicum*, *P. lilljeborgii*, *P. milium*, *P. obtusale* (D. K. K. and A. R. W.).

Cantire (101):—*Vertigo antivertigo* (J. E. Forrest).

Kildare (125):—*Vertigo angustior* (Leixlip : D.K.K.).

Kerry N. (148 N.):—*Pisidium conventus* (A. W. Stelfox).

Kerry S. (148 S.):—*Vertigo lilljeborgi* (A. R. W.).

RECORDER'S REPORT (Marine).

I FEAR that very little progress has been made in the matter of the census, at all events on the lines that were intended, viz. that specimens should be sent to the Recorder for his inspection, and by him written down for the habitats of these species.

Would not far more rapid progress be made if such well-known and reliable authorities as Mr. J. R. le B. Tomlin, Mr. R. Winckworth, Dr. Wilfrid Jackson and others were to send in lists of the species in their cabinets with full particulars

of the occurrence of each species? If information as to members of other phyla of animals found with the shells, plants on which they occur, and any points of ecological interest were given at the same time, the scientific value and interest of such documents would be greatly increased.

Of course it should be stated in every case if the shell was found living, but at the same time I do not think that dead shells should be ignored, as they often serve as a reliable indication of what is to be expected at a given place, and of the frequency of a species there. For example at l'Etac, Jersey, *Galeodina carinata* (da Costa) and *Rissoa albella* (Lovén) were picked up dead in the ratio of about 1/50, the difference of frequency of living specimens was not so great, but the latter species was far the commoner.

A list of my collections on the above lines is being made, it is no small work even in the case of my comparatively small number of species, so that it is evident that in the case of very large collections this work would have to be done gradually. Miss K. M. White and Miss N. Fisher have sent me lists which were the result of collecting in the Isle of Man and Ireland respectively. These lists are appended. The former is of particular value in that it contains several nudibranchs and an interesting case of the association of *Lamellaria perspicua* (Linné) in the test of the ascidian *Leptodinium maculatum*. I ask all who can to help forward this important work during the next year.

Miss K. M. White's Isle of Man species include the following :

Jorunna johnstoni A. & H., *Goniodoris nodosa* Montagu, *Adalaria proxima* A. & H., *Tritonia hombergii* Cuvier, *Berthella plumula* Montagu, *Lamellaria perspicua* Linné.

Miss Fisher sent the following species :

Limatula sulcata (Brown) dead but fresh. Portaferry.
Brachystomia scalaris (Macgillivray) dead. Rosguill.
Zirphæa crispata (Linné) fairly fresh. Dingle Bay, Kerry.
Dentalium entalis (Linné). Red Bay, Antrim.
Venerupis pullastra (Montagu) dead. Dingle Bay.
Lora trevelliiana (Turton) fresh. Portstewart.
Philbertia purpurea (Montagu). Green Island and Portstewart.
Rissoa lilacina (Récluz) dead. Kerry.
Retusa retusa (Maton and Rackett) dead. Strandhill Bay.
Chrysallida obtusa (Brown) dead. Killyleagh.
Cardium exiguum (Gmelin) dead. Malahide.
Lepton clarkiae (Clark) fresh. Strandhill. Good condition.
Mysella bidentata (Montagu) dead. Giant's Causeway.
Philbertia asperrima (Brown)? very dead. Strandhill.
Rissoa parva (da Costa) var. *inconspicua* dead. Dingle Bay.
Actonia punctura (Montagu) dead. Dingle Bay.
Vitreolina sinuosa (Scacchi) alive. Killyleagh.

Port Erin, Isle of Man :

Patina pellucida. Large and opaque shell.
Calliostoma zizyphinum conuloide.
Gibbula cineraria
Littorina littorea. Large.
L. (Littorivaga) saxatilis. Large.
L. (Melarhaphe) neritoides petraea.
Crepidula fornicata. Dredged in Port Erin Bay.
Lamellaria perspicua. Very common on *Leptodinium maculatum*.
Tethys punctata.
Tritonia hombergii.
Acanthodoris pilosa.
Goniodoris nodosa.

Cadlina lævis.

Pecten maximus. Dredged.

Chlamys opercularis. Young specimens, dredged very abundantly.

Ensis ensis.

YORKSHIRE CONCHOLOGICAL SOCIETY.

Report of the Yorkshire Branch of the Conchological Society of Great Britain and Ireland.

The 1932 syllabus covered an undoubtedly attractive programme, and the meetings have been carried out accordingly. In spite of this, however, the Officers and Council feel some little disappointment at the very poor attendances and this has been more particularly noticeable at the excursions. Membership is in no way seriously affected but the work done by the Society and the enthusiasm of its members has undoubtedly been considerably less than for some years past.

The officers for 1932 were :

President : J. C. North, F.R.P.S.L. ; *Vice Presidents* : H. J. Armstrong and K. G. Howell ; *Secretary* : J. R. Dibb, F.E.S. ; *Council* : K. Howell, W. Gyngell, Miss K. Morehouse, Miss E. Dufty ; *Recorder* : H. L. Armstrong. The following is a brief synopsis of the meetings held.

January : Exhibits of Limnæidæ and short papers. Although the exhibits were by no means confined to the Limnæidæ they were successful as were also the short papers. The contributors were : Mrs. E. M. Morehouse, J. D. Firth, H. J. Armstrong and K. Howell. This meeting was held by kind permission of Mr. and Mrs. Firth at their house.

February : Mr. J. C. North, F.R.P.S.L., delivered his most interesting Presidential address entitled : "Reminiscences of how I became a collector." The meeting was held at the Secretary's house.

March : Dr. H. C. Versey lectured at the Leeds University Geological Dept. taking as his subject "The History of the North Sea as shown by the Mollusca." The lecture was admirably illustrated by lantern slides.

April : Meeting held in conjunction with the Conchological Society of Gt. Britain at Manchester and devoted to exhibits.

Summer excursions were held as follows :

May : Winterset Reservoir and Royston. The day was perfect and attendance very sparse. Specimens were not abundant. In the evening a visit was made to the Barnsley Museum. Mr. W. R. Barker was in charge of the party.

June : A joint meeting with the Y.N.U. Conchological Section and the York Field Naturalists Club at York.

July : An Excursion to Bramham near Leeds. Weather was perfect but attendance poor.

Sept : A joint meeting with the Y.N.U. Conchological Section and Doncaster Scientific Society at Kirk Smeaton near Doncaster.

October : The 36th Annual Meeting was held in Leeds when Officers were elected for 1933 and the new Syllabus tentatively arranged.

Two meetings are yet to be held, namely, in November a joint meeting with the Parent Society in Leeds when Dr. J. W. Jackson will lecture, taking as his subject "Shell Lore" In December Mr. C. E. N. Bromehead of York will be lecturing upon "Extinct Pleistocene Land and Fresh-water Mollusca in England."

Membership now stands at 33.

JOHN R. DIBB, *Hon. Sec.*

ANNUAL REPORT OF THE LONDON BRANCH.

THE London Branch, meeting at the Cripplegate Institute, E.C.1 has had a successful year. Nine meetings have been held, with a good attendance at each, Mr. A. S. Kennard, A.L.S., continuing in the chair. Although Field meetings had to be abandoned owing to holidays the indoor meetings were of particular interest. Those devoted to the reading of notes on "Shell Structure," "Radulæ and their bearing on Classification" and "British Slugs" may be taken as examples of a new departure. It was thought that subjects such as these would have a wide appeal to all members, and would lead to lively discussions; this was found to be the case and the syllabus has been worked through as printed with every success. Mr. A. Blok very ably conducted the evening on "Shell Structure," illustrating his remarks with black-board diagrams, acid tests and exhibits of sections, including Carpenter's own sections used when writing his classic paper on the subject.

In a like manner Lt.-Col. A. J. Peile described and exhibited his preparations of the radulæ of Land, Marine and Freshwater genera.

A note by the President at the last meeting of the Session on the "Use of Mollusca for Ornament, Currency, etc.," proved very popular, and among the numerous exhibits the valuable collection of Snuff-Boxes shown by Miss J. D. Robertson called for particular remark.

The 1932-3 Session, for which a syllabus was prepared at the June meeting, commences with the Annual General Meeting on Monday, October 10th.

GUY L. WILKINS, *Hon. Sec.*

603rd Meeting, joint with the Yorkshire Conchological Society, held in the Department of Geology, The University, Leeds, on Saturday, November 12th, 1932.

Mr. John C. North (President of the Yorkshire Society) in the chair.

Among those present were Messrs J. F. Musham, J. R. Dibb, T. W. Saunders, H. Sowden, K. Howell, K. G. Hower, R. Davis, C. H. Moore, E. Stainton, H. Marshall, H. J. Armstrong, J. D. Firth, Mr. and Mrs. Franklin, Mr. and Mrs. T. Benstead, Mrs. Morehouse, Miss Morehouse, Miss Dufty, Drs. H. C. Versey and J. W. Jackson.

Members Deceased.

H. J. Stobart Col. E. C. Freeman.

Lantern Lecture.

The Hon. Secretary, Dr. J. Wilfrid Jackson, gave a lecture on "Shell Lore," and dealt with the many uses of shells, both in the past and at the present time. Amongst other things, reference was made to Tyrian Purple, Shell Trumpets, Pearls and Pearl-shell, and Cowries as Charms and Amulets.

A cordial vote of thanks to the lecturer was passed unanimously.

A vote of thanks was also accorded to the authorities of the Leeds University for the use of the room and the lantern.

Exhibits.

Many specimens in illustration of the lecture were shown by Mrs. Morehouse, Mr. H. J. Armstrong and the lecturer.

Other exhibits were :-

By Mr. H. Sowden :- *Subulina octona*, from Glasgow, and *Anodonta* sp., from Barnsley.

By Mr. C. H. Moore :- Vars. of *Nucella lapillus*, and small British Marines.

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THE
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BEING THE ORGAN OF THE CONCHOLOGICAL SOCIETY
OF GREAT BRITAIN AND IRELAND.

HON. EDITOR:
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23, BOSCOBEL ROAD,
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PLATE VIII.

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By R. WINCKWORTH, M.A.

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T H E
JOURNAL OF CONCHOLOGY.

VOL. 19.

DECEMBER, 1933.

No. 11.

A VISIT TO LOCH SKENE IN SEARCH OF
LIMNÆA BURNETTI.

By A. K. LAWSON.

(Read before the Society, September 10th, 1932).

HAVING arranged to visit Scotland my friends and I decided to include a run through the beautiful Vale of Moffat and to take the opportunity of paying a visit to Loch Skene in search of *Limnaea burnetti*. Perhaps a short description of our experiences may be of interest.

Loch Skene lies about half way between Moffat and Birkhill, some six miles from either place, and is situated amidst glorious mountain scenery with never a house of any kind in sight.

Leaving Moffat one keeps a sharp look out for a small notice board on the left, on the near side of a burn crossing the road beneath an old stone bridge. This board states that the Grey Mare's Tail, a fall of 200 feet, can be viewed in a crevice between the mountains. The burn flows out of Loch Skene and it sounds an easy matter to follow it to its source, or at least it did to us when receiving instructions as to finding the loch. It is useful, however, to know on which side to proceed. We took the left hand side where a well-marked path leads to the fall, but this path dies out at the fall, and the climb beside the burn is an extremely steep one of some 1,000 feet over the shoulder of White Combe.

To the botanist, especially if interested in ferns and mosses, this side must be a revelation, but to the conchologist eager to search for *Limnaea* it is by far the more trying route, and it took us an hour and ten minutes to reach the top, only to discover that Loch Skene lies two miles away amongst the hills, a tramp over rough and boggy ground.

A narrow path on the right of the burn has a much easier gradient, but there are several dangerous gaps in the path where small-stoned scree have to be crossed with a fall of 2/300 feet, almost sheer down to the valley. Visitors should carry as little as possible, a pond-stick, scoop and tin, and boots or shoes should be suitable for mountain climbing. Having eventually reached the top and followed the burn to its outlet from the loch, a small island will be seen near the shore

to the left. This can be reached by means of boulders and here it was we found a number of the molluscs. There are no waterweeds of any kind in the loch upon which the mollusca can feed, and we saw only a dozen or so large reed stems, almost leafless. The bottom of the loch is strewn with large boulders and sizeable stones, rough and sharp, and all covered thinly with a soft brown growth. Careful search reveals a little roundish excrescence here and there—*L. burnetti*. We were very sparing in our collecting and only removed seven adults, deeming it best to leave the young ones at home. One of the shells had been damaged and repaired itself in rough fashion. Two clusters of eggs with their jelly-like coating were brought up, examined and returned to the water.

A description of *L. burnetti*, together with figures, appears in the J. Conch., Vol. ix, p. 299. It is recorded in the Census for five vice-counties—Carmarthen, Dumfries, Perth N., Fermanagh and Westmeath.

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN & IRELAND

604th Meeting, held at the Manchester Museum, December 7th, 1932.

Mr. G. C. Spence in the chair.

Resignations.

W. M. Cross

Miss A. Bryant.

Papers Read.

"*Rumina decollata* L. in captivity," by H. E. J. Biggs.

"*Cypræa vinosa* Gmelin (= *pantherina* Dill.) in a Saxon woman's grave in Somerset," by J. Wilfrid Jackson, D.Sc.

"The Recent Non-Marine Mollusca of the British Isles," by J. Davy Dean.

"*Limnæa pereger* Müll., var. *maritima* Jeff. at Gullane Point, Firth of Forth," by D. K. Kevan.

"A reversed *Hygromia hispida* (L.) near Brighton," by A. G. Stubbs.

"Helix Tor" and "Snaily House," by Professor A. E. Boycott, M.D., F.R.S.

"The Size of British Mollusca," by W. B. Salmon.

"*Pisidium conventus* Clessin in Carnarvonshire," by C. Oldham.

"Notes on *Hygromia revelata* (Mich.)," by C. Oldham.

"*Ancylus fluviatilis* Müll. bred in a bell-jar," by C. Oldham.

"Non-Marine Mollusca of Eastbourne District," by George Shrubsole.

"Additional Notes on the Land and Freshwater Mollusca of Sussex," by J. Gordon Dalgliesh.

"A Giant Form of *Planorbis corneus* (L.)," by Lionel E. Adams.

"Food of Slugs," by C. H. Moore.

"Description of a New Species of *Geomelania*, with notes on the History of the Genus," by J. Davy Dean.

"On the sub-genus *Apoma* Beck," by G. C. Spence.

Exhibits.

By Mr. C. Oldham :- Specimens to illustrate his papers.

By Mr. L. E. Adams :- Giant *Planorbis corneus* (L.) from Burgh Heath, Surrey, to illustrate his paper.

By Mr. J. Davy Dean :- *Geomelania peilei* n. sp. to illustrate his paper.

By Mr. G. C. Spence :- Specimens of *Apoma* to illustrate his note.

By Mr. A. K. Lawson :- Scalariform examples of *Planorbis complanatus*, found at Rochdale about 1860.

By Mr. C. H. Moore :- Foreign *Limnæa* and *Planorbis*.

605th Meeting, held at the Manchester Museum, January 4th, 1933.

Mr. G. C. Spence in the chair.

Candidate Proposed for Membership.

Mrs. Mary Norman, Box 663, Sarasota, Florida, U.S.A. (introduced by J. W. Jackson and G. C. Spence).

Member Deceased.

A. W. Wincott.

Resignations.

Rev. Dr. A. H. Cooke.

C. C. Laverack.

Papers Read.

"Names of British Marine Mollusca, I." by R. Winckworth, M.A.

"*Limnæa truncatula* Müller—a minute form," by Lionel E. Adams, B.A.

Exhibits.

By Mr. L. E. Adams :- Specimens to illustrate his note.

The Special Exhibit was *Thiara*, and examples were shown by Messrs. G. C. Spence and C. H. Moore; also the Manchester Museum (Darbishire collection).

ACCOUNTS FOR THE YEAR ENDED DECEMBER 31st, 1932.**Income and Expenditure Account.**

RECEIPTS.				EXPENDITURE.			
£ s. d.				£ s. d.			
To Annual Subscriptions				By Publishing and distributing			
for 1932:				<i>Journal of Conchology</i> , Vol.			
138 at 10/-	69	0	0	xix, no. 6	37	15	11
3 at 7/6	1	2	6	„ no. 7	66	6	9
16 at 5/-	4	0	0	„ no. 8	27	16	11
	74	2	6	„ Authors' Repts.	13	4	1
Arrears ...	5	10	0	Less pd. by ..			
				Authors ...	1	19	3
	79 12 6						
„ Sale of Publications ...	19	10	5		11	4	10
„ Advertisements ...	3	8	0				
„ Contribution to costs of					143	4	5
Publication... ..	41	12	6	Less Contributions			
				by Authors for			
				illustrations ...	2	7	6
				Grants from Re-			
				search Fund...	4	10	0
				Provision in A/c			
				for 1931 ...	45	0	0
					51	17	6

RECEIPTS (<i>contd.</i>)	£	s.	d.	EXPENDITURE (<i>contd.</i>)	£	s.	d.
					91	6	11
				„ Printing List of Marine			
				Mollusca	17	8	0
				„ Printing and Stationery	3	0	0
				„ Cost of Removing ...			
				“Taylor” Collection...			
				to Manchester ...	3	14	4
				„ Expenses of Annual ...			
				Meeting	4	12	0
				„ Warehousing Stock ...	1	10	0
				„ Fire Insurance	0	10	0
				„ Subscriptions :			
				Zoological Record o 5 0			
				Lancs. & Chesh.			
				Fauna Com'tee o 5 0			
				Malac. Society 1 1 0			
					1	11	0
				„ Officers' Expenses ...	7	16	10
				„ Balance, being excess of			
				income over expenditure	12	14	4
					144	3	5

Life Membership Fund.

To amount of Fund, Jan. 1st,	£	s.	d.	By Commission on Purchase	£	s.	d.
1932	299	1	6	of Stock	0	2	6
„ Composition Fee ...	6	6	0	„ Amount of Fund, Dec.			
„ Dividends and Interest	14	19	4	31st, 1932	320	4	4
					320	6	10

Research Fund.

To amount of Fund, Jan. 1st,	£	s.	d.	By Grant to Author for	£	s.	d.
1932	211	6	6	Illustrations	4	10	0
„ Dividends and Interest ...	9	9	7	„ Amount of Fund ...			
				December 31st, 1932	216	6	1
					220	16	1

BALANCE SHEET.

Liabilities.	£	s.	d.	Assets.	£	s.	d.
Annual Subscriptions paid in				Investments			
advance	4	5	0	4% Funding Loan, £365 8 7			
Life Membership Fund ...	320	4	4	cost	300	0	0
Research Fund	216	6	1	4½% Conversion Loan, ...			
Balance of Income				£202 13 3			
& Expenditure A/c as on				cost	200	0	0
January 1st, 1932 11 12 3				3½% War Stock £40 11 8			
Balance for 1932 12 14 4				cost	40	0	0
					540	0	0
				Cash at Bankers	15	14	8
				Cash in Printers' hands ...	9	7	4
					565	2	0

NOTE.—Assets in addition to those set out in the Balance Sheet are (a) Library; (b) Cabinets and Collections; (c) Stock of unsold Publications; (d) Annual Subscriptions in arrear.

CHAS. OLDHAM,

Audited and found correct, January 3rd, 1933.

Hon. Treasurer.

C. H. MOORE, }
F. TAYLOR } Auditors.

606th Meeting, held at the Manchester Museum, February 1st, 1933.

Mr. G. C. Spence in the chair.

New Member Elected.

Mrs. Mary Norman.

Paper Read.

“Notes on British Mollusca,” by A. P. Gardiner.

Exhibits.

By Mr. G. C. Spence: *Spathopsis rubens* (Lam). and *Aspatharia sinuata* Mts. from N. E. Nigeria.

607th Meeting, held at the Manchester Museum, March 1st, 1933.

Mr. G. C. Spence in the chair.

Member Deceased

Rev. E. H. Nash.

Papers Read.

“Additional Notes on the Land and Freshwater Mollusca of Sussex,” by J. G. Dalglish.

“The Marine Shells of Port Alfred, S. Africa, Errata, etc.” by Lt. Col. W. H. Turton.

Exhibits.

By Mr. C. H. Moore: Species of *Goniobasis*.

By Mr. A. K. Lawson: *Clausilia laminata* v. *albina* from Houghton Forest, Sussex; *Neritina cantiana* (fossil), from Swanscombe, Kent.

By Mr. G. C. Spence: Species of *Opisthoporus*.

608th Meeting, joint with the Yorkshire Conchological Society, held at Manchester Museum, April 8th, 1933.

Mr. G. C. Spence in the chair.

Among those present were Messrs. J. C. North, W. H. Davies, C. H. Moore, K. Howell, K. J. Howell, H. J. Armstrong, S. V. Wild, A. K. Lawson, Mrs. Morehouse, Drs. G. H. Carpenter and J. W. Jackson.

Paper Read.

“On the Occurrence of *Annicola taylori* (E. A. Smith) and *Bithynia leachi* (Sheppard) in Scotland,” by Rodger Waterston.

Exhibits.

By Mr. H. Watson: Swiss specimens of *Oxychilus* (*Morlina*) *glaber* (Studer in Fér.) in various stages of growth, and English, French and Swiss specimens of *O. helveticus* (Blum) showing the marked differences between the shells of the two species in both young and old examples.

By Mr. W. H. Davies: Shells from the Bridgwater Canal, Monton, Lancs., including *Physa heterostropha*; the same species from the canal at Reddish, Lancs., with *L. auricularia* v. *albida*; *H. virgata* m. *sinistrorsum*, from Llandudno.

By Mr. K. Howell : *Limax maximus* v. *sylvatica* from Kirk Smeaton, and *Arion ater* v. *fasciata* from Adel, Yorks.

By Mr. G. C. Spence : Drawer of *Ennea*.

By Mr. A. K. Lawson : Species of *Hygromia*.

609th Meeting, held at the Manchester Museum, May 6th, 1933.

Mr. G. C. Spence in the chair.

Resignations.

G. Despott, E. J. H. Waters, C. Hibbert.

Member Deceased.

A. W. Pye.

Exhibits

By Mrs. Morehouse : Marine Shells from Robin Hood's Bay, Yorks., including *Littorina saxatilis* var. *tenebrosa*, and *Margarites helicinus*.

By Dr. J. W. Jackson : Marine shells from Kitchen-Middens of Early Iron Age in caves at Ballintoy, Co. Antrim, including large *Patella vulgata* L. (64 × 55 mm.), *Littorina littorea* (L.) (35.5 × 26 mm.) ; also for comparison, *P. vulgata* L. (59 × 54 mm.), from Brown's Bay, Islandmagee, N. Ireland (J. W. J. 1904) and *L. littorea* (L.) (36 × 26 mm.), from Larne Harbour, (J. W. J. 1904)

610th Meeting, held at Manchester Museum, September 16th, 1933.

Mr. G. C. Spence in the chair.

Members Deceased.

W. Gyngell. Rev. E. N. Dalton.

Papers Read

"A New Species of *Goniodoris* (Nudibranchiata) from South Africa," by Dr. K. H. Barnard.

"*Limapontia depressa* (A. & H.) var. nov. in Scotland," by D. K. Kevan.

"Note on the Variation of *Nucella lapillus* (L.) in various localities," by Guy L. Wilkins.

"On the Occurrence of *Theba cartusiana* (Müll) and *Helicella itala* (L.) at Charlottenlund Fort, near Copenhagen," by H. Schlesch

Exhibits.

By Dr. J. W. Jackson : *Helicella virgata* and m. *sinistrorsum*, from Ballintoy shore, Co. Antrim.

By Mr. G. C. Spence : *Patella vulgata*, *Littorina littorea* and *Nucella lapillus*, from burial in cromlech at Tyn-y-gongl, Anglesey : *Archachatina gaboonensis lambarenensis* Pils. and *A. spectaculum* Pils., from West Africa.

By Mr. C. H. Moore : *H. virgata* and *H. caperata* from Fleetwood, Lancs. ; *Carychium minimum* and *Hygromia striolata*, from Grange, Lancs.

A NEW DWARF RACE IN CYPRAEIDÆ.

Erronea (*Blasicrura*) *kieneri depriesteri* nov. subsp.

By F. A. SCHILDER, D. PH.

(Read before the Society, September 10th, 1932).

PLATE VIII.

Erronea (*Blasicrura*) *kieneri* (Hid.) is the largest species of the group of *E. (B.) hirundo* (Linn.). But there is a dwarf race (usually 11 to 13 mm. instead of 18 to 21 mm.), which is also relatively broader and higher; it has the extremities slightly more margined, the anterior columellar teeth are short¹ and the fossula is more concave; the bluish dorsal blotches are more distinct, because the brownish dots are very minute and scarce as well as the lateral spots which often become entirely absent.

Most specimens of this dwarf race come from the Dutch Indies (Wijnkoopsbaai and Tjilaoet Eureun in South-Western Java, Banjoe-wangi in Eastern Java, Madoera, Timor, Banda Sea, etc.), while the typical *kieneri* principally lives in the Western Indian Ocean (Mauritius, Zanzibar, etc.). The new race characterized above therefore evidently is a geographical subspecies. I propose to call it *depriesteri* in honour of Dr. W. F. de Priester, an ardent collector of shells in Dutch Indies, who sent home many very interesting populations of Cypræidæ which were kindly communicated to the writer by the collector's brother, Mr. L. de Priester at Apeldoorn.

The group of *E. (B.) hirundo* contains four species and two subspecies, viz.:

E. (B.) erythræensis (Sow.).

E. (B.) owenii (Sow.); syn.: *menkeana* (Desh.).²

E. (B.) hirundo hirundo (Linn.); syn.: *neglecta* (Sow.).³

E. (B.) hirundo ursellus (Gmel.); syn.: *coffea* (Sow.).⁴

E. (B.) kieneri depriesteri nov. subsp.

E. (B.) kieneri kieneri (Hid.); syn.: *hirundo* (Sow.).³

They can be distinguished as follows:

¹ In typical *kieneri* the columellar teeth usually become gradually shorter from the posterior to the anterior extremity of the lip, while in *depriesteri* they are greatly produced in the posterior half of the lip, and abruptly become restricted to the border of the aperture anteriorly.

² I hardly think *menkeana* separable as larger, broader subspecies.

³ See Hidalgo (1906) Mem. Ac. Cienc. Madrid, vol. 25, p. 177.

⁴ Gmelin's description fits "*neglecta*" as well as "*coffea*," but by no means *Melicerona listeri* (Gray) as it has been interpreted by some writers since Kiener. Two figures quoted by Gmelin (Rumphius and Martini) undoubtedly represent "*coffea*" with its characteristic dorsal markings, the third figure (Gualtieri) probably also belongs to the same species, though it is less clearly drawn.

Name	<i>erythraeensis</i>	<i>owenii</i>	<i>hirundo</i>	<i>ursellus</i>	<i>depriesteri</i>	<i>kieneri</i>
Most common in the	Red Sea	Western Indian Ocean	Indo-pacific	Malayan Archipelago	Malayan Archipelago	Indian Ocean
length mm. usually :	16—20	13—15	14—18	10—14	11—13	18—21
extremes :	15—25	9—21	11—23	9—16	8—15	14—24
usual relat. breadth	55—59	59—62	56—62	60—62	57—60	54—56
relat. height in per cent	43—47	44—46	44—49	48—50	44—46	42—43
teeth generally	less distant	distant	close	very close	rather distant	distant
usual numb. of labial teeth	19—21	15—17	20—23	20—22	15—17	17—18
colum. teeth ¹	17—18	12—13	15—17	16—18	12—14	14—16
extremities margined	distinctly	distinctly, expanded	distinctly	distinctly	slightly	scarcely
outer lip margined	slightly	distinctly	scarcely	scarcely	not	not
labial teeth crossing the lip to	$\frac{1}{3}—\frac{2}{3}$	$\frac{1}{2}—\frac{2}{3}$	$\frac{1}{2}—\frac{2}{3}$	$\frac{3}{4}—\frac{4}{4}$ ²	$\frac{1}{2}—\frac{3}{4}$	$\frac{1}{2}$
anterior colum. teeth idem	$\frac{3}{4}—\frac{4}{5}$	$\frac{1}{2}—\frac{2}{3}$	$\frac{1}{2}—\frac{2}{3}$	$\frac{2}{3}—\frac{4}{5}$	$\frac{1}{5}—\frac{1}{4}$	$\frac{1}{4}—\frac{1}{2}$
post. colum. teeth idem	$\frac{3}{4}—\frac{4}{5}$	$\frac{1}{2}—\frac{2}{3}$	$\frac{1}{2}—\frac{2}{3}$	$\frac{2}{3}—\frac{4}{5}$	$\frac{1}{2}—\frac{3}{4}$	$\frac{1}{2}$
fossula	broad, shallow	less broad, shallow	broad, rather concave	broad, concave	narrow, shallow	narrow, obsolete
bluish dorsal blotches	confused ³	indistinct ⁴	rather distinct ⁵	very distinct ⁵	very distinct ⁵	distinct ⁵
brownish dorsal band	broad, continuous	mostly wanting	narrow and interrupted, mostly restricted to the left margin			
dorsal specks	minute	distinct	minute	obsolete	obsolete	distinct
brown central blotch	large	mostly wanting	mostly distinct	mostly distinct	wanting	wanting
lateral spots	fine, reddish ⁶	numerous, mostly reddish	fine	fine	fine, rather scarce	often less fine
Good figures in Sowerby Thes. Conch. pt. <i>Cypræa</i>	323—324	367—368	374—377	359—360	—	382—384

1 The anterior terminal ridge always has been excluded as well as fine ribs in the concave space between this ridge and the projecting anterior columellar teeth.

2 The posterior labial teeth cross the margin as far as to the dorsum.

3 The central two fourths of the dorsum are slightly paler than the two distal ones.

4 The slightly tortuous paler zones seem to correspond to the markings of *hirundo* *hirundo*, though they mostly are hardly visible.

5 The anterior ovate pale spot (x in fig. 1) is very distinct in *depriesteri* and *kieneri*, hardly visible in *hirundo*, and always wanting in *ursellus*, *owenii* and *erythraeensis*. The dark blotch in the anterior fourth of the left margin (C in fig. 1) is well developed in *ursellus* only, it is smaller and mostly connected with the median anterior blotch (A+B) in *hirundo* and entirely wanting both in *kieneri* and *depriesteri*. In *hirundo* the blotch A+B+C is connected with the largest central blotch (D) on both margins of the shell, while in the other three comparable subspecies the pale anterior zone between A+B+C and D discharges itself into the white margins.

6 In *erythraeensis* only, the four larger spots on the extremities extend as far as to the base, and the basal ribs are bordered by fine reddish lines.

The bluish or greenish¹ tortuous markings characterizing the four last named subspecies correspond to the uniformly lilac layer of enamel in other Cypræidæ; this layer is deposited beneath the usually banded layer.² The scheme of the bluish tortuous markings is as follows (see pl. 8, fig. 1): There are three small spots (A, B, C) behind the anterior extremity, one four-branched central blotch (D)³ and one transversal zone next to the spire (E).⁴ In *ursellus*, A + B are confluent so that there usually seems to exist one only blotch, while C mostly is remote; in *hirundo*, C is connected with A + B, but in some specimens A and B are almost separated by an indistinct, paler, ovate area (x). In *kieneri* and *depriesteri* this area x becomes well marked, but the spot C seems to be always wanting.

Plate VIII shows some extreme or otherwise interesting varieties schematically drawn from specimens in the writer's collection. They may illustrate the fact that the general scheme of markings is constant, though the blotches can be diminished or confluent.

EXPLANATION OF PLATE VIII.

Schematical drawings of some varieties in *Erronea (Blasicrura) hirundo* and its allies.

- Fig. 1. Classification of markings: A-E bluish blotches; x pale area; t black terminal spots (omitted in fig. 2-12).
- Fig. 2. An *ursellus* with small blotches: A and B well separable.
- Fig. 3. An *ursellus* with typical blotches.
- Fig. 4. An *ursellus* with confluent blotches.
- Fig. 5. The type specimen of *depriesteri* from Tjilaoet Eureun (writer's coll. No. 3938).
- Fig. 6. A *hirundo* with a well recognizable area x.
- Fig. 7. A *hirundo* with typical blotches.
- Fig. 8. The type of *kieneri* var. *reductesignata* Schilder (see Arch. f. Naturgesch., vol. 90/A.4., p. 202 (1924); erroneously re-described as var. of "*neglecta*" in The Nautilus, vol. 40, p. 126 (1927); writer's coll. No. 2141).
- Fig. 9. A *kieneri* with blotches reduced in another way.
- Fig. 10. A *kieneri* with typical blotches.
- Fig. 11. A *kieneri* with rather abnormal blotches.
- Fig. 12. A *kieneri* with confluent blotches.

¹ These markings become brown to fawn in worn specimens, and pinkish in pellucid varieties.

² See Schilder (1927) Archiv. f. Naturgesch., vol. 91/A.10, p. 35

³ In very rare specimens the right posterior branch is separated as a small spot (fig. 9) while in other varieties it is entirely wanting (fig. 8).

⁴ The most right part of this "band" sometimes is rather constricted so that the blotch seems also to be composed of several spots (fig. 9).

ADDITIONAL NOTES ON THE LAND AND FRESHWATER MOLLUSCA OF SUSSEX.

By J. GORDON DALGLIESH, F.L.S. .

(Read before the Society, December 7th, 1932).

Testacella maugei Férussac.—Taken at Hove in October, 1932 by A. G. Stubbs. This would appear to be the first record for Sussex. During the first day it was placed in a box containing specimens of *Milax sowerbii* and nearly succeeded in devouring one of these had it not been forcibly restrained. The victim however died, the hinder parts of the unfortunate animal, where it had been seized, shrivelling away. On the second day the *Testacella* devoured a large earthworm all except the head which was rejected.

Helicella virgata Da C.—A very beautiful shell with pink transparent bands and a white animal was first discovered in 1930 on the cliffs at Roedean by A. G. Stubbs. The variety is extremely rare, only an occasional specimen turning up among the ordinary banded forms. It differs from the variety *hyalozona*, Taylor, in possessing pronounced rose-coloured bands which are, however, very evanescent.

Helicella itala var. **planorbis** Picard.—Findon, near Worthing.

Helicella heripensis Mab. Vars. *albicans* Kendall, *fulva* Kendall, and *lutescens* Kendall. West Blatchington and Saddlescombe.

Theba cartusiana Müller.—Rookery Hill, Bishopstone (J.G.D.); Edburton (A.G.S.).

Helix aspersa var. **undulata** Moq.-Tan.—Hove, September, 1932.

Cepæa hortensis var. **incarnata** Picard.—A specimen with a white lip found at "thrush stone," Chailey, in June, 1932, has been the first hitherto observed, all other Sussex forms of *incarnata* having a dark lip.

Var. **roseozonata** Cockerell.—At "thrush stone," Glynde, August, 1932: Paradise Wood, Eastbourne, received from W. A. Adkin.

Sphærium rivicola Leach.—In the Adur, Stopham Bridge, September, 1932 (A.G.S.). Swanton (Zoologist, 1915) says of this species that it is rare in Sussex. Having a partiality for deep water it may often escape the range of the scoop and in all probability has been overlooked.

Dredging operations might result in finding it in all Sussex rivers.



NOTES ON *HYGROMIA REVELATA* (Mich.).

By CHAS. OLDHAM.

(Read before the Society, December 7th, 1932).

MOST of the text-books say that *Hygromia revelata* lives under stones and at the roots of grass and other plants. Rimmer (*Land and Fresh-water Shells of the British Isles*, pp. 129-130), rather more explicit, says that in Guernsey it affects hollows on slopes where small pieces of disintegrated rock have slipped from above and are piled together. Among these loose stones a sorrel (*Rumex acetosella*) grows; the snails congregate about its roots, and, he suggests, feed upon the plant. Mr. A. Gardiner (*J. of C.*, xvi, p. 68), relying upon experience in Devon and Cornwall, supports Rimmer's suggestion that this small sorrel is a favourite food, for he found the snails chiefly at the roots of heather and under stones around which *Sedum acre* and the sorrel were growing.

So far as I know no author has remarked the liking of *revelata* for the Sea Campion (*Silene maritima*). Several visits to Cornwall in autumn and winter have convinced me that, although it may be found in other situations, its favourite habitat, or at any rate the one in which it is most easily observed, is the mats of *Silene*, sometimes three or four feet across, that are so plentiful and luxuriant on the sea cliffs. I do not know whether the snail feeds upon this plant, though it seems likely that the decaying leaves and stems are eaten, but that it lives and breeds in the cover afforded by the campion-mats is certain. I have not looked for *revelata* in Cornwall in the summer, but have no doubt that the mats are occupied throughout the year, for at Petit Bot Bay, Guernsey, I found it in them in hot weather in July, when it was difficult to find elsewhere. The patches of *Sedum anglicum* on the cliffs about the Land's End also harbour it, but not to the same extent as the *Silene*.

Associated with *revelata* in the campion-mats are other snails. On granite rocks at Penberth Cove on January 20th, 1929, I found *Arion ater*, *Vitrina pellucida*, *Hyalinia alliaria*, *Patula rotundata*, *Cepæa nemoralis*, *Cochlicopa lubrica*, *Clausilia rugosa* and *Pupa cylindracea*; and at Whitesand Bay, on October 26th, 1930, these species and *Hyalinia nitidula*, *Helix aspersa* and *Ashfordia granulata* in addition. such a varied association is, however, exceptional, especially in the less luxuriant mats on the drier rocks, where the only snails living with *revelata* may be *H. alliaria*, *P. rotundata* and *P. cylindracea*. In wet weather *Helicella virgata* may be seen crawling on the *Silene*, but probably it does not live in the mats. The Dolerite cliffs of

Nare Head, near Veryan, have a different vegetation from the granite where the steep slopes at the edge of the cliffs are covered with a dense sward of various grasses. At Nare the dominant plants on the cliff-face were *Pteris*, *Teucrium* and *Erica cinerea*, and the molluscan fauna was poorer. A few *H. aspersa* and *C. nemoralis* were about the cliff, but in the campion-mats themselves, where *revelata* was abundant, the only associated snails noticed were *Helicella caperata* and *P. cylindracea*. I kept no note of the snails associated with *revelata*—which was plentiful—in the Campion-mats on the serpentine rocks of Polbream Point, near the Lizard, in October, 1931. Other invertebrate inhabitants of the campion-mats on the granite in the Land's End district are beetles, centipedes, woodlice, an earwig (*Forficula auricularia*), and, somewhat to my surprise, in places as much as 200 feet above sea-level (e.g. at Nanjizal) the sand-hopper (*Talitrus locusta*).

In October *revelata* may be seen laying eggs in the humus that collects beneath the Campion-mats. The eggs, which are deposited in excavations so shallow that the bulk of the snail's shell is visible during deposition, are spherical, of a translucent white colour, and, owing to a glairy mucus, they cohere in a heap. The eggs in one such mass at Nanjizal, on October 16th, 1932, numbered 26. Probably some of the snails breed before October, for at least as many dead as living adults are then to be seen, and there are many immature snails with shells up to from 2.5 mm. to 3.5 mm. in diameter (e.g. at Nare Head on October 11th, 1932). By mid-January there are many with a diameter of 3.5 mm. to 4.5 mm. (e.g. at Penberth on January 20th, 1929). Living adults are then scarce, two measuring 5.6 mm. and 5.8 mm. found at Penberth on January 20th may have been particularly long-lived individuals, although they were slightly smaller than average adults, which have a diameter of 6 mm. or a trifle more. Of forty snails collected at Nanjizal in the last week of February, 1931, none was adult. It may be inferred that the life cycle occupies normally a year or thereabouts.

In the mild climate of western Cornwall *revelata* is, like *H. aspersa*, more or less active through the winter, though a temporary cold spell may induce temporary hibernation. On January 20th, 1929, after a rather cold, dry spell, some *revelata* were crawling sluggishly in the Campion-mats, others, with epiphragms, were lying mouth downwards, half buried in the underlying humus.

NON-MARINE MOLLUSCA OF THE EASTBOURNE DISTRICT

By GEORGE SHRUBSOLE.

(Read before the Society, December 7th, 1932).

THE area for the purpose of this List is within a seven mile radius from Eastbourne Town Hall. The sea occupying the lower, the upper half of this circle only has to be considered.

To the west the District begins about one mile beyond the Cuckmere Estuary and going inland includes Alfriston, Berwick, Arlington, passing north of Hailsham, through Wartling and reaching the sea again a little west of Normans Bay.

The District can be divided simply into three parts, which conveniently show the surface soil. A line being drawn from Eastbourne through Polegate to Hailsham, we have a Western Half and an Eastern Half. This Western Half may be again divided by the road from Berwick to Polegate into the Northern or Inland area and the Southern or Coastal area.

This *Southern* area of the Western Half of the District is high chalk Downland, which slopes down on the west to the Cuckmere Valley, and on the north and east to the roads Berwick-Polegate and Polegate-Eastbourne. Strips of Greensand and Gault border the Chalk Downs at their foot on the north and east to a little beyond the Berwick-Polegate Road. Patches of Clay with flints occur on the Downs; some of considerable extent. The Cuckmere Valley cuts through the Downs near the western boundary, the soil being alluvium. A few patches of alluvium also occur at Folkington, Wilmington and Willingdon.

The *Northern* area of the Western District beyond the Greensands and Gault is Weald Clay.

The *Eastern Half* of the District comprises various Levels, usually known as Pevensey Level or Marsh.

For convenience in this List the Marshes lying east of a line Pevensey to Hailsham are referred to as Pevensey Marsh and those to the west as Eastbourne Marsh.

The soil of the marshes is alluvium with the exception of a tongue of Weald Clay, about $\frac{3}{4}$ -mile in width, which enters at Polegate and runs to Stone Cross and Langney, and north of this clay is a patch of Tunbridge Wells sand, extending from Glynleigh to Westham, some $2\frac{1}{2} \times 1\frac{1}{2}$ miles in extent, with centre about Hankham.

Along the shore is a strip of shingle, running from Eastbourne to Pevensey Bay, some $\frac{3}{4}$ -mile in width at Langney, known as the Crumbles.

The most productive parts of the district for Land Mollusca are the chalk undercliffs, the lower slopes of the Downs, and the strip of country along the foot of them; Chalk and Upper Greensand, with occasional patches of gravel and alluvium. The district is not well wooded, but such woods as do occur lie mostly in the above country.

The High Downs, above 400 ft. Chalk and Clay with flints, carry a considerable snail population but the species are few; such species as are described in this List as "generally distributed," with *H. virgata*, *H. caperata* specially abundant and *H. heripensis*, *H. itala*, *C. hortensis* and *C. nemoralis* more locally.

The Weald Clay is poor hunting ground, both the soil and the prevalence of oak in the wooded portions render it unattractive to mollusca. Abbots Wood, by far the largest wood in the district, is disappointing for these reasons.

The Marshes and Cuckmere Valley, chiefly meadow land with few and poor hedges, produce little but the commonest species with such moisture lovers as *Z. nitidus* and *A. lævis*, and on the sedges *V. antivertigo*.

The patch of Tunbridge Wells Sand around Hankham is moderately productive but does not furnish any species not found elsewhere.

On the Crumbles with its scanty soil the snail population is not large but *H. virgata*, *H. caperata*, *T. cantiana*, *C. hortensis*, *C. nemoralis*, *H. aspersa*, *A. ater*, *A. lævis* and *A. agrestis* occur.

The Fresh Water mollusca are found mainly in the ditches of the Cuckmere Valley and the Marshes

Very few of these ditches, in the Marshes especially, have any perceptible current. Many are in a stagnant condition with a very foul bottom, which combined with their depth, renders dredging on the bottom impracticable. Some of the roads through and round the borders of the Marshes, however, provide smaller and shallower ditches with occasional swampy ponds. From such places the *Pisidia*, etc. enumerated are usually taken.

The Cuckmere, the only river, is not particularly productive.

The dew ponds and drainage ponds on the Downs seldom contain anything but *L. pereger* of small size; while the small ponds on the Weald Clay are, with few exceptions, very disappointing, probably owing to the fact that most of them are in the near neighbourhood of oak trees.

Brackish water is confined to the Cuckmere Estuary and a strip along the coast from Pevensy Bay to Normans Bay.

The coast, consisting of shingle and soft chalk cliff, is unsuitable to the one or two species which live above high water mark.

This list is not the result of an exhaustive search over the whole District. Much of the High Downs country has scarcely been touched and the same applies to many of the ditches of the Marshes, especially those lying at a distance from any road. But it is unlikely that extended search would produce many more species as the country and water are very similar to what has been examined.

It is likely, however, that this list can be further added to. *A. tridens* at Hellingly; *A. lineata*, *C. edentula*, *E. fulvus*, *Z. excavatus*, all near Rushlake; *P. hibernicum*, *P. milium* at Ashburnham, have been found not far outside the boundary.

In addition to the above it is possible further search may produce *M. gracilis*, *L. cinereoniger*, *T. haliotide*a and *U. tumidus*.

Jenner (List of L. and F. W. Mollusca of E. Sussex 1884) states that *L. auricularia* was found in a ditch near the Railway, Eastbourne. This ditch may have been destroyed since, but the ditches in this neighbourhood now do not look likely habitats for this species.

Thanks are due to Mr. Oldham for very kindly naming all the Pisidia found in this List, and to Dr. Boycott for confirming the naming of various specimens.

I have followed the nomenclature of Ellis' "British Snails."

Pomatias elegans Müll. Very plentiful in the hedge banks on the lower slopes of the Downs on Chalk and Upper Greensand. Less common near the coast.

Sabanæa ulvæ Pennant. Cuckmere Estuary, on the mud in brackish pools.

Hydrobia ventrosa Mont. Cuckmere Estuary: East of Pevensey Bay. In countless numbers on the mud in rather less brackish water than *S. ulvæ*.

Hydrobia jenkinsi Smith. Cuckmere, Eastbourne and Pevensey Marshes. In practically all waters of the District, including isolated ponds.

Bithynia tentaculata L. Cuckmere, Eastbourne and Pevensey Marshes. Very generally distributed.

Bithynia leachii Shep. Cuckmere, Eastbourne and Pevensey Marshes. Pond at Polegate. Generally distributed in the Marshes, but local.

Valvata piscinalis Müll. Cuckmere, Eastbourne and Pevensey Marshes. Generally distributed.

Valvata macrostoma Steenbuch. Langney, Pevensey, Normans Bay, Glynleigh. Appears to show a preference for the larger drains with a slow current (sluices) and ditches in connection with them.

Valvata cristata Müll. Cuckmere, Eastbourne and Pevensey Marshes. Local, but plentiful where it occurs.

Phytia myosotis Drap. Cuckmere Estuary and Pevensey Bay. Plentiful on the banks of the river and of brackish pools.

Carychium minimum Müll. Plentiful all over the District amongst dead leaves, etc.

Limnæa truncatula Müll. Crumbles, Hankham, Cuckmere Meadows, Pond at Hampden Park. Local. Frequently not in water but on wet mud.

Limnæa palustris Müll. Cuckmere, Eastbourne and Pevensey Marshes, Crumbles. Occurs in most ditches.

Limnæa stagnalis L. Cuckmere, Eastbourne and Pevensey Marshes, ponds at Hankham, Hailsham and Folkington. Found in most ditches of the Marshes, but in the Cuckmere only above Alfriston.

Limnæa pereger Müll. Cuckmere, Eastbourne and Pevensey Marshes. Dew ponds on the Downs. Found practically in all waters.

Ancylastrum fluviatile Müll. River Cuckmere at Alfriston, Sherman and Chilver bridges, not common.

Ancylus iacustris L. River Cuckmere from Alfriston bridge, Pevensey Marsh, Hailsham Pond. Fairly numerous on water lily leaves in the river.

Aplecta hypnorum L. Ditches at Alfriston and Eastbourne Marsh, Crumbles, Normans Bay, Glynleigh, ponds at Polegate and Berwick. Local and scarce. Usually found in shallow ditches, scarcely more than swampy ground, at the roots of sedges and flags. Does not seem to frequent the deep ditches of Pevensey Marsh. If present it would be difficult to dredge.

Physa fontinalis L. Common in most ditches of the Marshes. Pond at Polegate.

Planorbis corneus L. Eastbourne and Pevensey Marshes, Crumbles. Found in many of the ditches, but somewhat local.

Planorbis planorbis L. Present in almost all ditches in all the Marshes. Ponds at Hankham and Polegate.

Planorbis carinatus Müll. Eastbourne Marsh. So far only found in one ditch.

Planorbis vortex L. Common in almost all ditches.

Planorbis vorticulus Troschel. Ditch near Pevensey, Pevensey Castle Moat. Appears to prefer a ditch encroaching on the grass, being found among the grass tufts.

Planorbis spirorbis L. Cuckmere Valley at Exceat and Alfriston, Eastbourne Marsh, one ditch, Normans Bay, Crumbles, Ponds at Polegate and Hankham. Fairly common in the Cuckmere Valley, but not in the other marshes.

Planorbis albus Müll. Generally distributed in all the Marshes, River Cuckmere, Hailsham Pond.

Planorbis crista L. Hailsham Pond and pond near Berwick. Should be found in the Marshes.

Planorbis contortus L. Common in nearly all the ditches of all the Marshes. Ponds at Polegate and Hankham.

Planorbis complanatus L. Pevensey Marsh, Hailsham Pond. Local and not plentiful in the Marsh.

Segmentina nitida Müll. Eastbourne and Pevensey Marshes, Glynleigh. Rather local.

Testacella scutulum Sow. Common in gardens in Eastbourne, Holywell.

Succinea elegans Risso. Three specimens which have been authenticated have been obtained from a ditch near Littlington. Unfortunately the ditch has been constantly raked to keep it clear of weeds and the habitat may have been destroyed.

Succinea pfeifferi Ross. Occurs on the vegetation in many of the ditches of all the Marshes; The Crumbles.

Succinea putris L. Cuckmere Valley from Littlington to Chilver Bridge. On the banks of the river or of ditches in connection with it.

Vertigo antivertigo Drap. Pevensey Marsh on sedges.

Vertigo pygmæa Drap. Beachy Head, West Dean. Probably generally distributed.

Pupilla muscorum L. Beachy Head, Victoria Drive. Uncommon.

Lauria cylindracea da Costa. Generally distributed; on the Downs and their slopes, Pevensey Castle, Abbots Wood.

Abida secale Drap. Holywell, Beachy Head, Wannock, Littlington, Wilmington, Ratton. Probably occurs all over the Downs on the chalk.

Pyramidula rupestris Drap. On a flint and mortar ivy-grown wall at Hankham.

Vallonia costata Müll. Common on the Downs and their lower slopes.

Vallonia pulchella Müll. Hankham, Warren Coombe, Milton Street. Probably generally distributed in moist situations.

Vallonia excentrica Sterki. Paradise, Beachy Head, Exceat Littlington. Fairly common.

Acanthinula aculeata Müll. Paradise, Wannock. Probably occurs in other places. Requires careful search.

Cæcilioides acicula Müll. Eastbourne, Wannock, West Dean, Littlington, Beachy Head. Probably generally distributed and fairly numerous. A single ant heap on Beachy Head yielded 6 specimens without disturbing the soil.

Cochlicopa lubrica Müll. Common over the whole district.

Ena obscura Müll. Common over the whole district.

Punctum pygmæum Drap. Paradise, Hankham, lower slopes of Beachy Head. Probably occurs generally but requires special search.

Goniodiscus rotundatus Müll. A very common snail all over the District.

Arion circumscriptus Johnston. Paradise, Duke's Drive, Wannock, Wartling, West Dean. A common slug.

Arion hortensis Fér. Almost everywhere.

Arion intermedius Normand. Wood at Glynleigh.

Arion subfuscus Drap. Abbots Wood, Hankham, Wartling, West Dean. Not uncommon.

Arion ater L. Common everywhere.

Balea perversa L. Paradise, Compton Place, Duke's Drive, Folkington, Hankham, Abbots Wood. On the trunks of trees and on overgrown walls.

Clausilia rugosa Drap. Found all over the District, usually in the neighbourhood of trees.

Clausilia rolpheii Leach. Wartling, Abbots Wood. On roadside banks in the vicinity of trees. So far not found on the chalk.

Marpessa laminata Mont. Hampden Park, King's Drive, Willingdon Road, Wannock, Abbots Wood. Fairly common near trees or young wood.

Helicella itala L. Holywell, Beachy Head, Warren Coombe, Friston, Jevington, Wannock. Several large colonies occur on the slopes of the Downs. Preference seems to be shown for a more or less southern aspect.

Helicella virgata da Costa. Plentiful on the Downs and their lower slopes (chalk). Also along the Crumbles to Pevensy Bay (shingle).

Helicella heripensis Mabille. Local but plentiful. Colonies occur on the Downs and their slopes, usually on the grassy banks on the edge of cultivated fields.

Helicella caperata Mont. Common on and around the Downs. Occurs also at the Crumbles and Pevensy Bay.

Cochlicella acuta Müll. One colony is known at West Dean on the slope of the Downs.

Theba cartusiana Müll. Occurs on the banks of tow-path, River Cuckmere, below Littlington.

Theba cantiana Mont. A very common snail in the hedges and banks all round and on top of the Downs. On the Crumbles and at Hankham.

Trichia hispida L. Plentiful all over the District.

Trichia striolata Pfeif. Almost everywhere.

Ashfordia granulata Alder. Only single specimens have been found in two localities. Usually this species is most abundant where it occurs.

Arianta arbustorum L. Wannock, King's Drive. So far only found in these two situations. One of them covers a very small area.

Cepæa hortensis Müll. The Downs, Hankham, Crumbles, and Abbots Wood. Occurs locally on the Downs in colonies. Less freely in the other situations, and in some hedge banks.

Cepæa nemoralis L. The Downs, Ratton, Willingdon Road, Wartling, The Crumbles, Abbots Wood. On the Downs it occurs in colonies locally, most of the shells being band forms of var. *libellula* Risso.

Helix aspersa Müll. Plentiful on the Downs and in all other parts of the District. Many varieties occur.

Zonitoides nitidus Müll. Generally distributed in the marshes in damp situations, and the Cuckmere Valley where it is common.

Retinella radiatula Alder. Beachy Head, Duke's Drive, Wannock, Abbots Wood, Milton Street. Local, and not found in great numbers.

Retinella pura Alder. Duke's Drive, Paradise, King's Drive, West Dean, Wannock, Wartling. Generally distributed in suitable situations.

Retinella nitidula Drap. Very common all over the district.

Oxychilus alliarius Miller. Paradise, West Dean, Friston, Jevington, Abbots Wood, lower slopes of Beachy Head. Local and not plentiful.

Oxychilus cellarius Müll. Very common all over the District.

Oxychilus lucidus Drap. Common in gardens in Eastbourne, on the Parades, and the lower slopes of the Downs round the town.

Vitrea crystallina Müll. Paradise, Duke's Drive, Beachy Head, West Dean, Littlington, Hankham. Generally distributed in suitable situations.

Vitrina pellucida Müll. Widely distributed.

Milax gagates Drap. Gardens in Eastbourne. Not common.

Milax sowerbyi Fér. Gardens in Eastbourne, the Parades, Rodmill, Wilmington. Not uncommon.

Agriolimax lævis Müll. King's Drive, Cuckmere Valley, Crumbles, Hankham. Appears to be generally distributed in wet situations.

Agriolimax agrestis L. Common on the Downs, fields and in gardens.

Limax maximus L. Paradise, Meads, King's Drive, Glynleigh, Ratton. Probably generally distributed.

Limax marginatus Müll. Paradise, Abbots Wood. Probably further search would extend its range.

Limax flavus L. Generally distributed. Very common in Eastbourne gardens.

Unio pictorum L. Plentiful in the River Cuckmere above Sherman Bridge.

Anodonta cygnea L. Plentiful in Pevensey Haven from Pevensey to Rickney, especially near Rickney. Occurs also in the River Cuckmere above Sherman Bridge.

Anodonta anatina L. Occurs in Pevensey Haven and River Cuckmere above Sherman Bridge. Not so plentiful as *A. cygnea*.

Sphærium corneum L. Common in the ditches of all the Marshes. Pond at Polegate.

Sphærium lacustre Müll. Ponds at Westham, Hailsham and Folkington, Langney Drain, ditches from Rickney to Pevensey, ditch near Hampden Park, Alfriston. Does not appear to inhabit the deep ditches of the Marshes, but rather ponds and roadside ditches.

Pisidium amnicum Müll. Cuckmere River and ditch at Alfriston.

Pisidium casertanum Poli. Dew pond, High and Over.

Pisidium nitidum Jenyns. Ditches at Alfriston, Pevensey Marsh, Rickney, Tutt's Barn, Dew Pond at High and Over.

Pisidium obtusale Jenyns. Ditches, Eastbourne Marsh, Tutt's Barn, Normans Bay, Crumbles, ponds at Polegate, Westham and Hailsham. The commonest species in the District.

Pisidium personatum Malm. Ponds at Polegate and Hankham.

Pisidium pulchellum Jenyns. Pond at Westham, ditch at Pevensey Marsh.

Pisidium subtruncatum Malm. Ditches at Alfriston and Pevensey Marsh. Pond at Westham.



EDITORIAL NOTES.

THERE has not been a previous opportunity of mentioning the death of Tom Shaw Oldroyd which occurred on Nov. 4 of last year. Though he was never a member of our Society, his wife is, and some of us a few years ago had the pleasure of meeting both in London, when they were collecting data for the 4 vol. work which Mrs. Oldroyd subsequently published—"The Marine Shells of the W. Coast of N. America." Mr. Oldroyd was born in Huddersfield 80 years ago but had lived almost all his life in America, and had been for years a member of the Stanford Univ. Geol. Dept., in California.

Another death which we regret to chronicle is that of Edward Step, which occurred on Nov. 8, 1931. He died 3 days before his 76th birthday after a long illness, following on an operation. Though not a member of the Conch. Soc. his name was familiar to most as a writer on Natural History; the "Wayside and Woodland" series is well-known, and he also wrote popular works on Crustacea, Insects and Shells, and they were always well and fully illustrated. His "Shell Life" must have been in the hands of many members of this Society, as the only Handbook on our Marine Mollusca. It was published in 1901 with 32 photographic plates and many woodcuts, and in 1927 a new edition appeared with many of the plates excellently coloured.

We have only recently seen a paper by Dr. Bowell on the Microscopy of Radulæ, published in the Journ. Royal Microscopical Soc. vol. 48 pp. 161-177. This admirable paper gives a short résumé of the history of the study, before proceeding to an elaborate account of up-to-date methods of investigation and technique. The paper, which is illustrated by good photographs, is of special interest in view of the author's Presidential Address last year.

From B. [A. W.] Russell's "The Conquest of Happiness," 1930, p. 150:—"I have not had the pleasure of knowing any large number of conchologists, but from those who have, I have always understood that the study of shells brings contentment to those who engage in it."

The Ann. Soc. Roy. Zool. de Belgique, vol. 62, pp. 25-29, contains a very exact detailed account of the distribution of *H. aspersa* in Belgium by M. Léon Fredericq. The suggestion is made that its area of dispersion is limited by the rigours of the winter of central and northern Europe.

The same serial, pp. 45-52, has a paper by M. L. Verlaine on snail-shells broken by birds and rodents, in continuation of one published in Aug. 1931 (Congrès Nat. des Sci., Bruxelles, 1930, 789-792).

The author details many discoveries of broken shells, and experiments with Blackbirds and Thrushes. The latter, however, would not attempt to break *H. pomatia*, and though he did not succeed in inducing various captive rats to break a *pomatia*, he came to the conclusion that it is done by some rodent or other in the wild state.

“THE MARINE SHELLS OF PORT ALFRED, S. AFRICA.

BY LT. COL. W. H. TURTON, D.S.O., R.E.

(Read before the Society, March 1st, 1933).

MR. TOMLIN who has checked over the names in my book discovered that as many as 20 of them are *preoccupied*. Four of those in the following list are my fault, and two are Sowerby's for I merely copied his names. With regard to the other fourteen, none of these are in Paetel's Catalogue which I always thought was a standard authority up to the date of its publication in 1888, so they should have been included there. They must of course be renamed now, and I have pleasure in calling six of them after Mr. Tomlin who has taken a great deal of trouble in the matter. Some of them were the names of fossil species. The numbers and pages prefixed to each species are those from my book.

No.

259. p. 34 *Marginella piperata lineata*, Sby. 1889, non *M. lineata* Lmk. Anim. s. Vert. VII, 361, 1822. I rename it *M. p. becki*.
260. p. 34 *Marginella piperata strigata*, Sby. 1889, non *Voluta strigata* Dillwyn. Descr. Cat. Recent Shells I, 530, 1817 which is a *Marginella*. I rename it *M. p. helena*.
287. p. 38 *Marginella tenuis*, new sp. non *Volvaria tenuis*, Reuss, Geogn. Skizze aus Böhmen II, 206, 1844, which is a *Marginella*. I rename it *M. teres*.
329. p. 44 *Voluta africana ponderosa*, new var. non *Voluta ponderosa*, Solander, Cat. Portland Mus. 25 and 189, 1786. I rename it *V. a. rietensis*.
346. p. 46 *Mitra perexilis*, new sp. non *M. perexilis*, Conrad Foss. Shells Tert. N. America (4) October 1833, p. 46. I rename it *M. tomliniana*.
352. p. 47 *Mitra helena*, new sp. non *M. helena*, Bartsch, Smithsonian Inst. United States National Museum, Bulletin 91, p. 43, 1915. I rename it *M. becki*.
436. p. 59 *Nassa pyramidalis affinis*, new var. non *N affinis*, J. de C. Sowerby, Trans. Geol. Soc. London (2) III, p. 419, 1832. I rename it *N. p. rufanensis*.
516. p. 72 *Columbella albuginosa major*, new var. non *C. major*, Sby. P.Z.S. 1832, p. 119. I rename it *C. a. rietensis*.
603. p. 84 *Scalaria producta*, new sp. non *S. clathratula producta*, Jeffreys, P.Z.S. 1884, p. 136. I rename it *S. kowiensis*.
754. p. 104 *Odostomia obtusa* new sp. non *O. obtusa*, Gould, Proc. Boston Soc. Nat. Hist. VII. 405, 1861. I rename it *O. tomlini*.

761. p. 105 *Odostomia obeliscus* new sp. *non O. obeliscus* Jeffreys. Ann. & Mag. Nat. Hist. (3) I. 46. I rename it *O. becki*.
1038. p. 145 *Rissoa gemmula* new sp. *non R. gemmula*, Fischer, Les Fonds de la Mer, I, 151, 1869. I rename it *R. tomlini*.
1039. p. 145 *Rissoa perfecta*, new sp. *non R. perfecta*, Smith, P.Z.S. April 1890, p. 290. I rename it *R. becki*.
1044. p. 146 *Rissoa crassilabrum*, new sp. *non R. crassilabrum*, Garrett, Proc. Calif. Acad. Nat. Sci. 1857, p. 102. I rename it *R. rufanensis*.
- 1146 p. 161 *Patella longicosta intermedia*, new var. *non P. vulgata intermedia*, Murray, Ann. & Mag. Nat. Hist. (2) XIX, p. 211, 1857. I rename it *P. l. kowiensis*.
1186. p. 167 *Patella alboradiata*, new sp. *non P. alboradiata*, Gmelin, Syst. Nat. ed. XIII p. 3702, 1791. I rename it *P. tomlini*.
1200. p. 169 *Patella pulchella*, new sp. *non P. pulchella* Blainville, Dict. Sci. Nat. XXXVIII, 92, 1825. I rename it *P. becki*.
1219. p. 172 *Phasianella kochii viridis*, new var. *non P. viridis*, Anton. Verzeichniss, p. 60, 1839. I rename it *P. k. rietensis*.
1380. p. 199 *Cyclostrema roseotincta*, new sp. *non C. roseotincta* Smith, P.Z.S. 1871, p. 737. I rename it *C. tomlini*.
1402. p. 202 *Nerita dubia*, new sp. *non N. dubia*, Recluz, Rev. Zool. V, p. 78, 1842. I rename it *N. tomlini*.



Limnæa truncatula Müller—A minute form.—I have recently received several specimens of *L. truncatula* which agree with Jeffreys' var. *minor* in all respects except size. Jeffreys never gives any authors of varieties, and probably var. *minor* is of his own naming. His measurements are—L. 0.285 (=7.3 mm.), B. 0.165 (=4.3 mm.). The largest of those sent me measures 3.5 mm., others rather less, in height. These are quite adult with the full complement of whorls, 5½-6. Jeffreys gives the habitat of this variety as "mountainous tracts and seaside marshes." Those sent me were collected in brackish marshes at Barton-on-sea. It may be that the salt in the water is the cause of the dwarf size, but I have never noticed that brackish water had any great effect on the size of freshwater shells.—LIONEL E. ADAMS (*Read before the Society*, January 4th, 1933).

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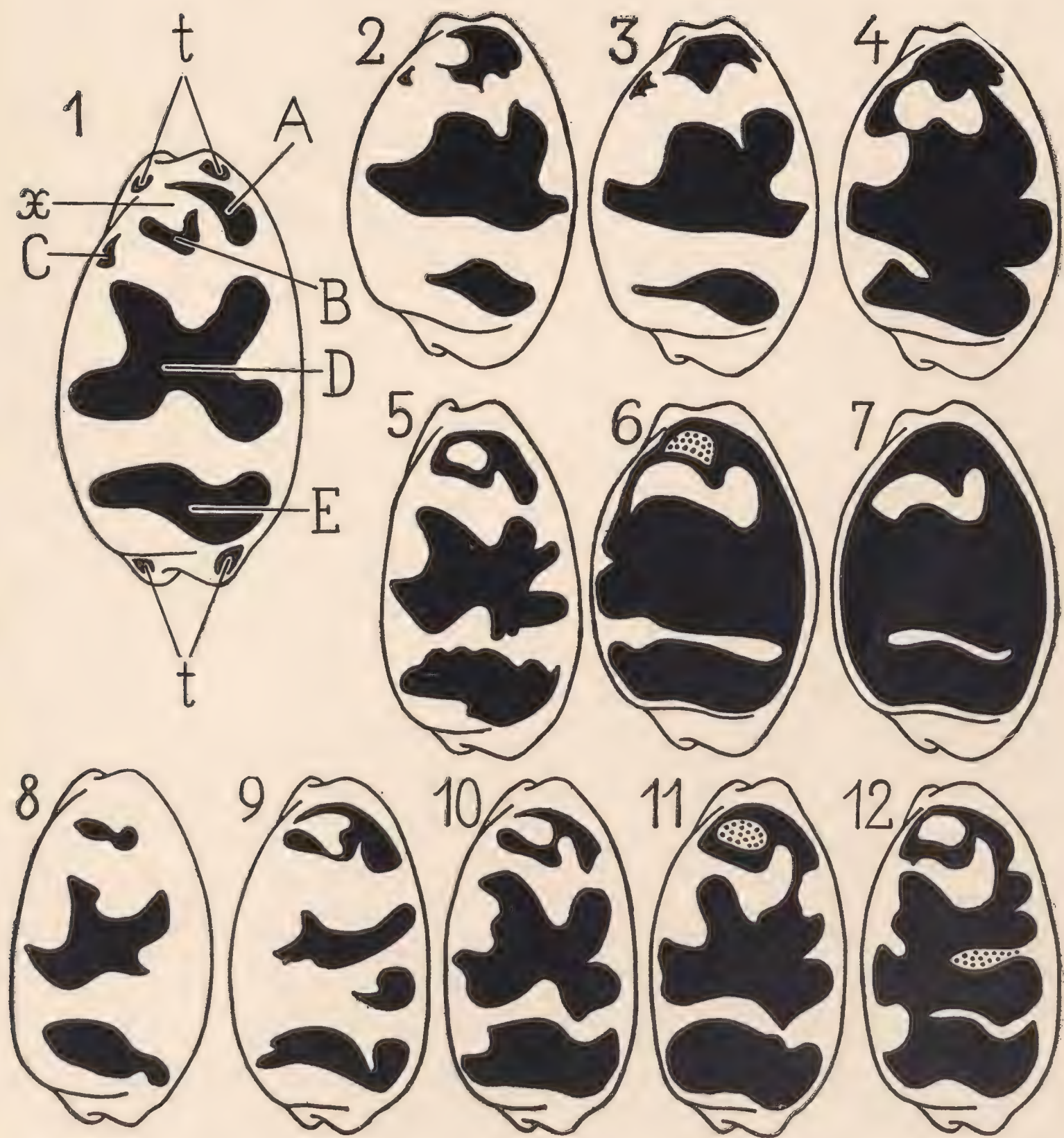
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- 31, Last line for "Byrant" read "Bryant."
47, for "*cotispunctata*" read "*costispunctata*."
107, 126 for "Thorne" read "Thorner."
123, for "XVIII, p. 299" read "XIX, p. 30"
138, for "*Migakimarutsuno*" read "*Suberimarutsuno*."
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